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JIT PURCHASING: A GUIDE FOR SUCCESSFUL IMPLEMENTATION WITHIN THE DOD

by

Michael B. McPeak

December 1995

Principal Advisor:

Mark Stone

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A GUIDE FOR SUCCESSFUL IMPLEMENTATION
WITHIN THE DOD**

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Submitted in partial fulfillment
of the requirements for the degree of

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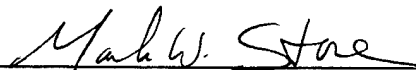
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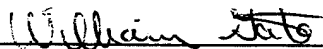


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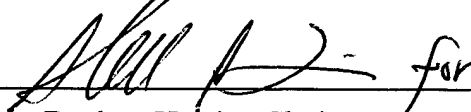
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ABSTRACT

Just-In-Time purchasing is a materials management system that has been successfully implemented in various commercial and Government entities in recent years. The major issue in this thesis is: "What are the elements that ensure successful implementation outcomes between the Government purchasing offices and various commercial contractors?" The objective is to determine the critical elements for implementing a Just-In-Time purchasing operation. The intent is to provide a guide for implementing Just-In-Time purchasing so other agencies can duplicate the success of this process. The Just-In-Time purchasing process substantially reduces inventories through electronic order placement, long-term contracts, and direct delivery from the vendor to the user. The Department of Defense can capture these benefits by implementing Just-In-Time purchasing in all Government purchasing offices.

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I. INTRODUCTION

A. BACKGROUND

In the wake of the end of the cold war and the victory in Operation Desert Storm came a call from the civilian and military leadership to downsize the military. The impact of that order can be seen in a dramatic reduction in manpower and infrastructure for all of the Services. The Bottom Up Review (BUR) and the Base Realignment and Closure Commission (BRAC) are the vehicles upon which a smaller force and a smaller Department of Defense (DOD) budget is planned and executed. The declining budgets were further exacerbated due to numerous contingency operations such as those in Somalia and Haiti. This has deeply affected the DOD's ability to fund even routine operations and procurement.

The declining budgets have focused the military's attention toward doing more with less and finding inventive ways to get the most from their procurement dollars. DOD has had to look in every area, from operations to administration, to find ways to cut waste, improve efficiency, and still maintain a viable defense force. One area on which Congress and DOD have focused much of their attention in the last decade is the enormous inventories that are carried to support operating forces throughout the world. The General Accounting Office (GAO) has been repeatedly called upon by Congress to determine the dollar value invested in the military's expansive inventories. This has led DOD, and most specifically the Defense Logistics Agency (DLA), to direct those

organizations that buy and store the inventories to apply commercial purchasing initiatives to ensure inventory levels are kept at the minimum to support forces while providing a surge protection of only the most vital spare parts.

In 1992, the Defense General Supply Center (DGSC) in Richmond, VA., and other DLA supply centers were tasked by DLA headquarters to implement the Buy Response Vice Inventory (BRVI) program. This program includes several elements: Long-Term Contracting (LTC), Direct Vendor Delivery (DVD) and Electronic Commerce/Electronic Data Interchange (EC/EDI). BRVI is primarily a derivative of the commercial Just-In-Time (JIT) production initiative started by the Japanese in the 1950s and adopted by numerous U.S. companies since the 1980s.

Commercial JIT purchasing has not only provided the means for dramatic inventory reductions for the numerous U. S. companies that have implemented it, a limited number of Government organizations are also finding the path to lower inventories through JIT purchasing.

B. OBJECTIVE

The objective of this thesis is to analyze successful Just-In-Time (JIT) relationships between the Defense General Supply Center (DGSC) and various commercial contractors to determine the elements and procedures that can ensure successful implementation of JIT purchasing at other Government purchasing offices and inventory control points.

By determining the successful implementation elements, a guide can be developed that may make implementation easier and more effective at all Government purchasing activities.

C. THE RESEARCH QUESTION

The primary research question is: "How can DOD organizations implement JIT purchasing thereby reducing inventories of on-hand stock?" The subsidiary research questions are:

- What is Just-In-Time purchasing?
- What benefits are derived from implementing JIT purchasing?
- What is the magnitude of the inventory problems within the DOD?
- What are the key elements that constitute a successful JIT purchasing operation?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

This study focuses on the initiatives at the Defense General Supply Center (DGSC) with regard to the Buy Response Vice Inventory (BRVI) program, a Government purchasing initiative program that contains common elements with commercial Just-In-Time (JIT) purchasing. The BRVI initiative was analyzed to determine those factors that may help and/or hinder successful implementation of JIT purchasing at other DOD activities. In addition to information provided by the Defense General Supply Center (DGSC), contractor purchasing operations personnel were

interviewed and surveyed to determine those elements that were either a significant barrier to implementation or hindered the implementation process. No other limitations were included in this study.

The key assumption in this study is that the reader is familiar with general business and Government relationships through the purchasing process.

E. LITERATURE REVIEW AND METHODOLOGY

The literature used in this study consists of periodicals, including: International Journal of Purchasing and Materials Management, California Management Review, Journal of Business Research, Production and Inventory Management, and Purchasing. Several theses related to JIT also were studied as part of the research. Two reference books on the subject of Just-In-Time purchasing by Abdolhossein Ansari and by Peter Grieco provided valuable reference material. An additional book on Japanese Manufacturing Techniques by Richard Schonberger was included in the research materials. In addition to the literature, interviews were conducted with various contractor representatives that are presently involved in the Buy Response Vice Inventory (BRVI) program and with personnel at the Defense General Supply Center (DGSC) who are responsible for implementation and management of the BRVI program.

An extensive questionnaire was sent to ten commercial contractors that represent successful parties to long-term contracts and provide direct vendor delivery to Defense

General Supply Center (DGSC) customers. The companies represented include: 3M Company, Eastman Kodak, Rayovac Corporation, Grimes Aerospace and Mine Safety Appliance.

In order to determine those elements that are associated with successful implementation, the Defense General Supply Center (DGSC) was selected as the lead organization for this research due to the success of its Buy Response Vice Inventory (BRVI) program. The Defense General Supply Center (DGSC), due in part to the commodities they buy and manage, and their involvement in the Paperless Order Placement System (POPS) since the early 1980s, is recognized as one of the most aggressive proponents of commercial purchasing initiatives in DLA.

By combining the views both of industry and Government, this research attempted to identify and document the elements that helped ensure successful implementation of JIT purchasing as well as problems that should be resolved prior to implementation.

F. ORGANIZATION OF THE THESIS

The following chapters in the thesis document elements necessary to successfully implement JIT purchasing at DOD activities. Chapter II provides an in-depth review of the current problems with DOD inventories, emphasizing the excess inventories within specific Services. Chapter III provides the background of JIT purchasing and highlights the elements of Long Term Contracts/Supplier Relationships (LTC/SR), Direct Vendor Delivery (DVD), and Electronic Commerce/Electronic Data Interchange (EC/EDI).

Chapter IV provides questionnaire results of contractors who have successfully entered into a JIT relationship with DGSC. The questionnaire covered elements that enhanced JIT implementation along with those that provided a stumbling block to implementation. Chapter V details implementing procedures used by industry and Government and highlights those elements necessary for successful implementation. Chapter VI provides a summary of the information developed in the thesis, provides conclusions and recommendations, and lists areas that should be considered for further research.

II. DOD INVENTORIES

A. BACKGROUND

Before getting into the structure of JIT implementation, it is imperative the reader become familiar with DOD's inventory positions. The purpose of this chapter is to present the data to show that a considerable amount of DOD's secondary inventories are excessive. They remain a focus of attention for inventory managers throughout the DOD. Secondary inventories are defined as consumable and repairable items other than principal items, including parts and assemblies which support principal items, and other consumables, such as food, medical items, and fuel, which do not support principal items. [Ref. 11] The relevant inventory positions are examined for the Navy, Army, Air Force, Marines and DLA along with the reasons that exacerbate the current problem of excessive inventories. Excessive inventories are material that has completed reutilization screening within the DOD and is not required for the needs and responsibilities of any activity. [Ref. 11:p. 24] The final section of this chapter provides conclusions and recommendations.

The remainder of this chapter presents inventory totals for various commodities and situations. The totals are in constant year dollars listed in the corresponding reference. None of the listed dollar figures are prior to 1993.

B. DOD INVENTORIES

DOD has focused on the size of its secondary inventories during the last five years. This focus was brought about by the massive inventory increases experienced during the Reagan defense buildup. By 1989, DOD secondary inventories had reached an all-time record level of \$109.4 billion from a pre-Reagan \$43.4 billion level. [Ref. 11:p. 1]

Since the military drawdown commenced under the auspices of the Bottom-Up Review (BUR), DOD has substantially reduced secondary inventories, but more needs to be done. It is clear from military planners that a substantially smaller infrastructure is required to maintain the force directed by the Bottom-Up Review (BUR). It is also evident that secondary inventory items can follow infrastructure decreases and be reduced accordingly.

As illustrated in Figure 1, secondary inventories have been reduced approximately 30 percent in the past six years. The active inventory is the material which is expected to be consumed within the budget year (two years) and material that has been purchased to meet specific war reserve requirements. The inactive inventory is material that is not expected to be consumed within the budget period but is likely to be utilized in future years. [Ref. 11:p. 43]

DOD inventories are held and managed by the Armed Services and DLA. Over 4.7 million line items are currently held in DOD's inventory. On a yearly basis, the Services and DLA report their secondary items on hand. This information is collated and

Secondary Inventories On Hand

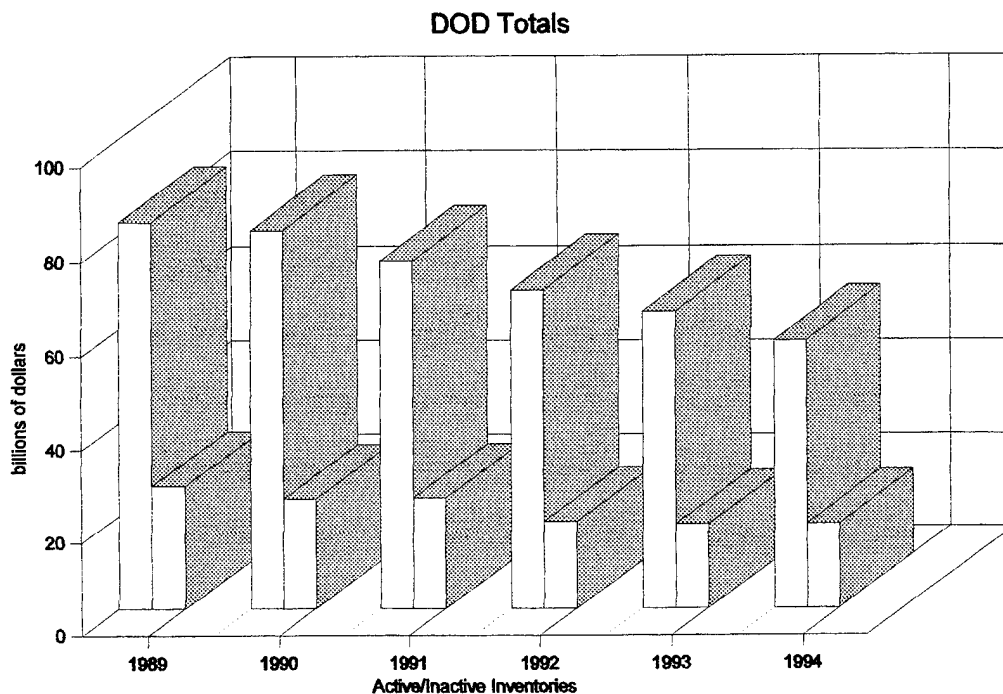


Figure 1. Source: DOD Supply System Inventory Report, 30 September 1994

compiled in DOD's Supply System Inventory Report, released at the end of each fiscal year. The report lists the inventories at the wholesale and retail level. Secondary inventory items are represented by 12 individual elements. The inventory elements include; aircraft components and parts; missile parts; weapons parts; tank and vehicle parts; ship and submarine parts; electronics, communications, control and information systems, and related parts; construction, industrial, and general supplies; petroleum; clothing and textile; subsistence; medical and dental material; and uncategorized minor

DOD Items Managed by Component

Total 4,782,000 (Fiscal Year 1995)

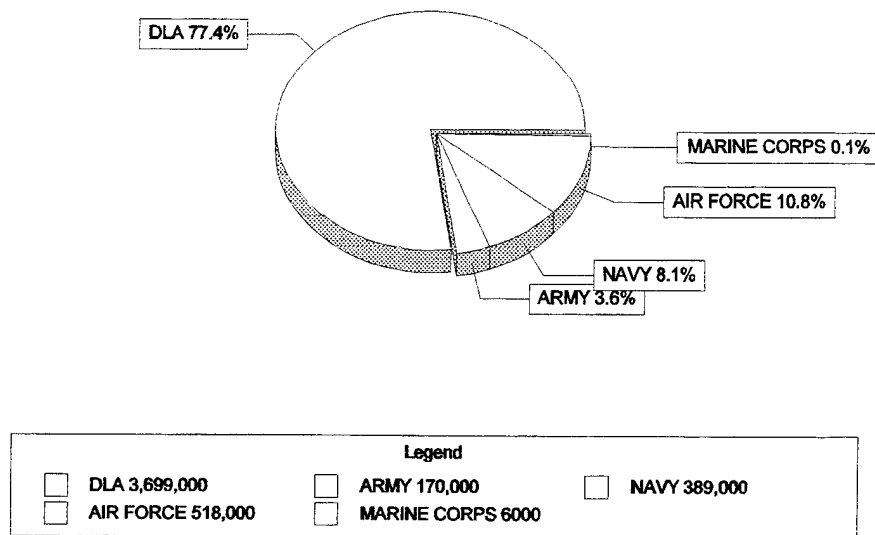


Figure 2. Source: DOD Material and Distribution Management Fact Book, Fiscal Year 1994

equipment, material and supplies. [Ref. 11] The breakdown of line items managed by the individual Services and DLA are illustrated in Figure 2.

Each Service and DLA contributes significantly to DOD's overall inventory position. DOD identified \$73.6 billion as secondary inventory at the beginning of fiscal year 1995. Of this, the Army maintained \$13.3 billion in inventory, the Navy \$18.4 billion, the Marine Corps \$0.6 billion, the Air Force \$31 billion and DLA \$10.3 billion. It should be noted that although DLA maintains the largest number of line items by a

Inventory Value by Component

Total \$73.61 Billion

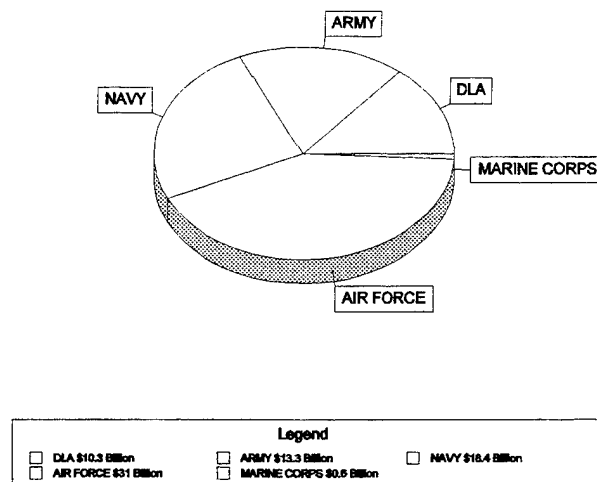


Figure 3. Source: DOD's Material and Distribution Management Fact Book Fiscal Year 1994

substantial amount, the items represent only 14% of the total dollar value. This is due to the large number of low value consumables each Service has transferred to DLA in the last five years. [Ref. 11] Consumable items make up much of the line items held by DLA and the Services. Figure 3 shows the relative contribution each Service and DLA makes to DOD's overall inventory.

C. EXCESS DOD INVENTORIES

DOD maintains a complex logistics system through which it manages several layers of inventory items. At the wholesale level, DLA buys large quantities of consumable items that it holds until needed by the military Services. At the military Service level, the Navy, the Army, and the Air Force also store consumable items to maintain and repair their land vehicles, ships, airplanes, and other equipment. Mechanics and others also keep supplies on hand so they may perform maintenance. As a result, DOD has inventory that is widely dispersed and hard to track; much of it exceeds DOD's needs. [Ref. 19:p. 14]

Large inventories in and of themselves do not reflect any overt problems until those inventories are compared to the inventories actually required to support necessary operations and provide surge protection. The difference between that which is required and actual inventories represents waste of tax dollars. The infrastructure and support costs necessary to manage the inventory can be added to the cost so that excess inventory costs are always understated. For example, DLA's contract administration, technical support, material handling and packaging, and inventory maintenance add to the cost of managing DOD's inventories. In fiscal year 1992, DLA charged the military Services about \$715 million for those Services.

In addition to the services needed to support the inventories, the warehouses necessary to provide security and protection from the elements also represent a cost that must be considered in the total cost of excessive inventories. Over the last several years,

DOD Inventories (Fiscal Year 94)

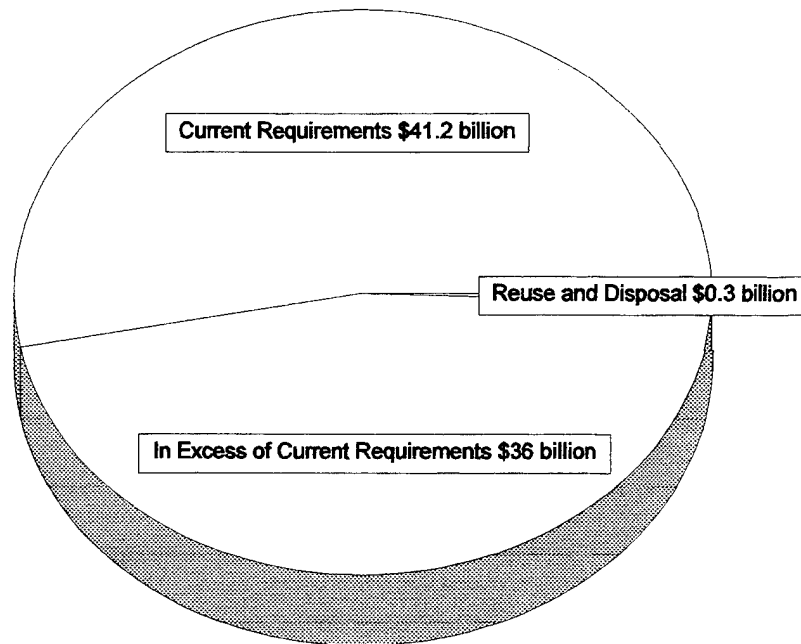


Figure 4. Source: GAO/HR-95-5 Defense Inventory Management

DOD has significantly reduced the number of storage depots and the inventory stored in them. As these storage depots are deactivated, DOD must find ways to reduce the excessive inventories so depot space can be utilized effectively. [Ref. 18:p. 1]

During the 1980s, DOD's excess, unrequired inventory increased at a faster rate than its overall inventory. In 1991, over 40 percent of the inventory of secondary items, or over \$30 billion, exceeded DOD's needs. [Ref. 21:p. 10] Figure 4 represents the breakout of DOD's inventory makeup in fiscal year 1994. As mentioned earlier, excess

inventory is the inventory that is not required for the Service to complete its assigned mission. One of the primary indicators of excess inventories is the number of days, or in some cases, number of years of stock on hand. To illustrate the length of time DLA stores some of its inventory, GAO analyzed the records of 45,000 storage locations at DLA's Columbus, Ohio depot. They found that approximately 34 percent of the inventory was between 3 and 10 years old, and about 3 percent was more than 10 years old. [Ref. 19:p. 15]

There is no pattern as to the type of commodity that experiences the most excesses. All commodity groups have excess inventory. Electronic items are typical of the excesses found. In September 1993, DLA categorized \$231.4 million of its electronics inventory, or 10.5 percent, as excess. Excess inventories can be disposed of or sold at salvage prices to other Government agencies or the general public. During fiscal year 1993, DLA disposed of or sold 123,114 items of excess inventory valued at its latest acquisition cost of \$516.8 million. Over 39,000 of these items, valued at \$48.2 million, had not had a demand from the Services within the last five years. [Ref. 19:p. 16]

At the Fleet and Industrial Supply Center (FISC), Norfolk, Virginia, three pump rotors, costing \$22,000, have remained in storage since 1970. They have been transferred to DLA for management and will be processed for disposal. At the same center, 10 bearings, worth \$5,590 each, were determined to be in excess and were subsequently disposed. [Ref. 18:p. 6]

At Warner Robbins Air Logistics Center, Warner Robbins, Georgia, 4,044 missile control systems, worth \$21 million, were in storage with no demands for many years. These control systems were subsequently disposed. [Ref. 18:p. 7]

Excess inventory occurs principally because DOD forecasts the Services' requirements far in advance, using past demand as its guide. Past demand, however, does not always indicate the Services' future needs. For example, the Services' demands often decrease from year to year due to weapon system modifications or retirements. DOD's efforts to downsize will also decrease demand for many items, as weapon systems operating levels decrease and troops are reduced. In addition, when DLA and the Service facilities store supplies for too long, they can deteriorate or become obsolete because of technological advances. [Ref. 16:p. 17]

In recent years, under pressure from Congress and other formal and informal oversight activities, DOD has modestly lowered the excess inventories. This was directly attributable to the 1990 Office of the Secretary of Defense (OSD) Service-wide Inventory Reduction Program (IRP). The changes in inventory requirements reflect the changing military threat.

In 1989, DOD's forces included about 2.1 million active duty soldiers, sailors, marines, and airmen; over 2,800 attack and fighter aircraft; about 570 ships; and 18 active Army divisions. To support these forces, DOD had inventories of spare and repair parts, clothing, medical supplies, and other support items. The inventory was valued at about \$92.5 billion, with an acquisition cost of about \$108 billion.

With the collapse of the Soviet Union, DOD altered threat scenarios and began downsizing its forces. By 1993, active duty military personnel had decreased to about 1.7 million; active attack and fighter aircraft to about 2,100; ships to 435; and active Army divisions to 14. DOD projects that its forces will continue to decrease at least through fiscal year 1996. Between 1989 and 1993, the value of DOD's inventory decreased by \$15 billion, to about \$77.5 billion (acquisition cost of about \$98.6 billion). [Ref. 17:p. 9]

Although improvement has been evident in the last few years, DOD's inventories and funding levels remain relatively high. The operating forces supported by the inventories have decreased and are projected to continue decreasing. [Ref. 17:p. 7]

Figure 5 represents operations and maintenance appropriations for inventory for fiscal years 1992-95.

DOD's excess secondary inventories are expensive because of the capital required to purchase the inventory and the other related cost factors. The material that is stored for long periods may become obsolete or may deteriorate to the point that it is unusable, even if it eventually becomes needed. Also, employees faced with materials that are clearly overstocked are more likely to develop a casual attitude about the security of those supplies. With materials overstocked, concern for losses diminishes because the employees know that requirements can be met with the remaining stock. [Ref. 21:p. 15]

D. FACTORS CONTRIBUTING TO EXCESSIVE INVENTORIES

DOD's inventory management problems are reflected in a long-held belief that overbuying and holding large numbers of items is better than being caught short when a customer requests an item. [Ref. 17:p. 3] This represents but one of several

O&M Appropriations for Inventory

(Billions of Dollars)

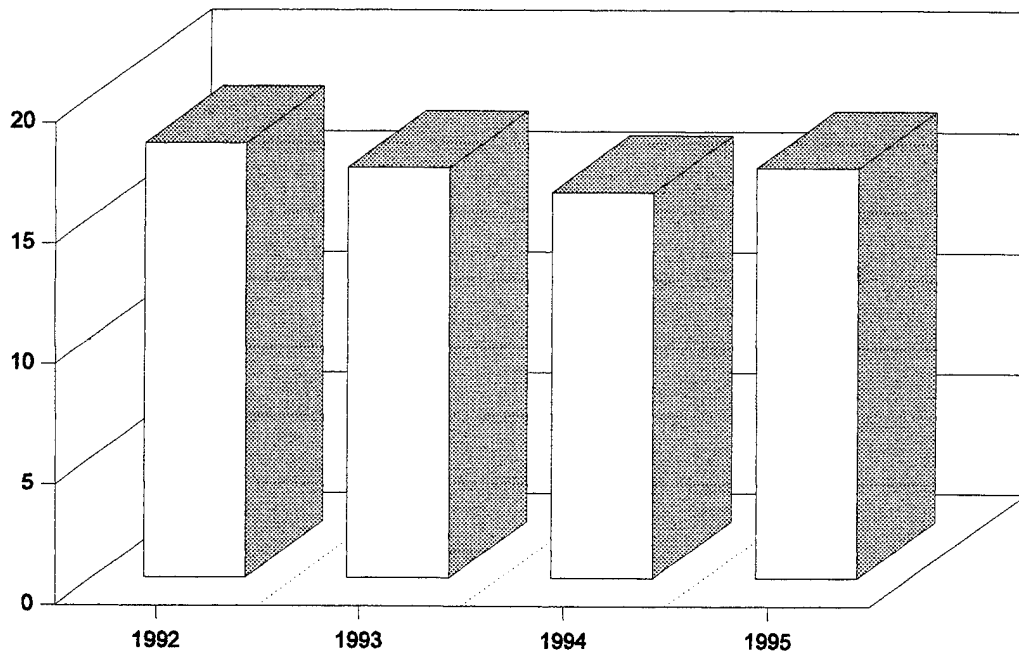


Figure 5. Source: GAO/HR-95-5 Defense Inventory Management

reasons why there is an excess of secondary inventories; other factors include: limited oversight, overstated requirements, weak financial accountability, and DOD's organizational culture.

1. Oversight of Inventory is Limited

One of the most important aspects of inventory management is for the inventory manager to know the quantity, location, and condition of each inventory item. Lacking this information, inventory managers make improper purchase decisions. For example, the General Accounting Office (GAO) reported in May 1994, that Army managers at one

base spent nearly \$800,000 to repair items when issuable assets were available in the Army's supply system. [Ref. 17:p. 17]

Asset visibility has become a top priority of the DOD. DOD's Corporate Information Management (CIM) initiative is the vehicle for improving asset visibility for in-transit assets and retail level stocks. The visibility plans should be completed by 1996. [Ref. 17:p. 17]

2. Requirements are Overstated

Without inventory visibility at the resale level, inventory managers may buy additional units that are not required. Historically requirements are overstated because DOD maintains inaccurate or unsupported data in its computer systems. Relying on bad data, the Services have often overstated requirements by millions of dollars and purchased items they do not need. The lack of accurate data stems from poor management control systems and a lack of oversight. [Ref. 21:p. 18]

As an example, in April 1984, the GAO reported that the Air Force had significant invalid back orders. These were considered as requirements in computing stock levels, making procurement and repair decisions, and in developing budgets. GAO and the Air Force Audit Agency identified over \$209 million of invalid back orders at 17 retail activities. The Air Force subsequently cancelled these orders. [Ref. 17:p. 19]

Overstating requirements leads to excess inventory which puts unneeded pressure on limited resources. As item managers become more vigilant in maintaining data bases, the requirements will reflect actual needs.

3. Financial Accountability is Weak

Financial accountability and control is necessary for item managers to keep unnecessary items from being ordered. If the item manager does not know what he/she has available then subsequent orders are made without up-to-date information. Weak financial accountability continues to be a problem, as indicated by the myriad of reports that GAO publishes on the subject. Weak financial accountability can cause excesses that deplete even more financial resources.

Examples of this type of problem are numerous. The Army Audit Agency's report on the Army's fiscal year 1993 financial operations disclosed that it could not verify over \$12 billion of inventory records. The Army Audit Agency estimated that 51 percent of the inventory records sampled had inaccurate information, either in terms of quantity or condition. [Ref. 17:p. 20]

Similarly, the Air Force Audit Agency reported on the Air Force's fiscal year 1993 financial operations. It disclosed that the Air Force's reported inventory of \$6.1 billion was not reliable because of inventory valuation, over and under reporting of quantities, and omissions of relevant inventory data. [Ref. 17:p. 21]

Not only does weak financial accountability impact excess inventories, it can effect military readiness. In Operation Desert Storm, the significant deficiencies in

tracking inventory and maintaining inventory records made operational support planning more difficult. Deficient records were responsible for duplicate orders, backlogs at aerial and sea ports, unnecessary material shipped into the theater, difficulty in prioritizing cargo backlogs, and inefficient intra-theater movement. [Ref. 14]

4. DOD Organizational Culture

Many of the problems associated with excessive inventories are compounded by the organizational culture that has existed for years. In the past, during periods of unlimited resources, item managers over-bought to counter any uncertainties in the inventory accountability system.

DOD has not kept pace with private industry in updating and streamlining its inventory management practices. At the expense of economy and efficiency, it has over-bought secondary items to ensure that it has more than enough supplies. A change in this organizational culture toward more modern commercial techniques would help DOD better manage its inventory of secondary items. [Ref. 21:p. 16] DOD has recognized the importance of changing the present organizational culture and has begun to focus the appropriate training on its logistics workforce.

E. CONCLUSIONS AND RECOMMENDATIONS

DOD maintains a vast and widely dispersed inventory that represents billions of taxpayer dollars. Inventory managers are tasked with maintaining those inventories at the appropriate levels to ensure military operations are sustained and completed.

During the 1980s, excess inventories, inventories which are not immediately required, grew faster than total inventories. These excess inventories represent billions of dollars in investment capital. Excess inventories have brought much attention from Congress and military leaders. In turn, this has placed added oversight on those who manage the inventory system.

A range of factors have caused DOD to hold larger than adequate inventories. A lack of oversight, overstated requirements, weak financial accountability, and an organizational culture that favors over-buying to compensate for inadequate information, are the factors that drive excess inventories.

DOD has recognized these problems and has attempted programs to correct them. Since DOD no longer has sufficient funds to support its long-standing business inefficiencies, it is particularly important that DOD generate improved, accurate inventory data; develop and implement better inventory policies and procedures; train supply staff in more effectively managing inventory operations; and bring sustained, high level commitment to making DOD inventory management more efficient and cost effective. [Ref. 21:p. 8]

Private sector companies have successfully managed their inventories by adopting innovative inventory strategies. DOD has experienced some positive results from these commercial practices. One program that addresses excess inventories is Just-In-Time purchasing. The remainder of this thesis will explore the JIT concept and the benefits derived from its use.

III. JUST-IN-TIME PURCHASING

A. INTRODUCTION

This chapter presents the history of Just-In-Time (JIT) purchasing from its roots in the early part of the 20th century until today. Once the history is established, the elements of a civilian JIT purchasing operation are discussed and the benefits derived from its implementation are examined. The remainder of the chapter highlights how the Government has taken this commercial practice and modified it to take into account the uniqueness of Government purchasing. Understanding the background and elements of JIT will help the reader understand the remaining chapters that discuss Just-In-Time purchasing and the Buy Response Vice Inventory (BRVI) program, the Government's version of JIT.

B. JIT DEFINED

A JIT inventory control system supplies input to a production or distribution site only at the rate the items are needed. Such a system reduces inventories whether it is used within the firm or as a mechanism regulating the flow of products between adjacent firms in the distribution channel. [Ref. 3:p. 113]

It is, in a sense, the uninterrupted flow of 100% acceptable materials delivered on due dates, at optimal costs, 100% of the time. Most companies not using JIT are required to maintain large inventories of consumables and parts to ensure that production lines and distribution are never interrupted. This represents an investment in inventory

and also in the infrastructure required to maintain the inventory, including warehouses, materials movement equipment, and the necessary accounting controls. [Ref. 23:p. 11]

The JIT manufacturing system improves product quality and productivity by eliminating waste. Waste is defined as anything other than the minimum amounts of equipment, materials, and workers that are absolutely essential to production. To have a pure JIT system, production and purchasing activities must be synchronized. In other words, the production system is not complete without adopting JIT purchasing practices. [Ref. 3:p. 9]

What if a company could be guaranteed that items would be delivered just-in-time to be used in a production process or distribution channel? Much of the funds tied up in inventory and infrastructure could be used in other, more profitable areas, such as research and development, marketing, or price reductions.

C. BACKGROUND

The Japanese have been given credit for inventing the just-in-time concept in much of the current literature. The philosophy underlying JIT was developed in Japan. It was introduced in the early 1950s by T. Ohno, Executive Vice President of Toyota Motor Company and perfected by Toyota in Japan. The idea was formalized into a management system when Toyota wanted to meet customers' precise demands for various models and style configurations with a minimum of delay. [Ref. 3:p. 9]

Following WWII, the Japanese required large influxes of capital, labor, and manufacturing process improvements to rise up from the ashes of war. In developing

JIT, the Japanese took advantage of their compact geography, intense work ethic, and their propensity for team work and attention to detail. They cultivated close working relationships between buying firms and their suppliers. [Ref. 8:p. 10]

During the 1950s many Japanese companies were experimenting with the JIT concept to make their companies more profitable. The combination of masses of human resources with few natural resources may help to explain Japanese resourcefulness. The Japanese make do with little and avoid waste. The modern Japanese system of factory management, the just-in-time approach, featuring hand to mouth management of materials, with total quality control, seems in character with its historical penchant to conserve. [Ref. 35:p. 3]

D. ELEMENTS THAT INFLUENCED THE DEVELOPMENT OF JIT PURCHASING

From the 1950s through the late 1960s, world economic conditions were generally favorable for the U. S., and the U.S. industrial base expanded. During this period, little attention was given to inventories. These economic conditions hid the problems that were soon to develop. [Ref. 3:p. 20]

In the early 1970s, events were unfolding that caused companies to discover the problems of excessive inventories. The 1973 oil embargo caused a sharp rise in oil prices. Many firms that were dependent on crude oil for their manufacturing found their

production costs had increased considerably. As the cost of operations increased, companies had to look for innovative ways to reduce costs. It was at this time companies began to discover JIT.

As the early 1970s transitioned into the middle 1970s, double digit inflation added additional strain on companies' bottom lines. This focused attention on tightening inventories and reducing costs. Higher inventory carrying costs, related principally to the jump in interest rates, pushed the companies away from traditional inventory practices toward purchasing smaller quantities and carrying a lower safety stock. [Ref. 3:p. 21]

Due to the problems encountered in the 1970s and 1980s, the conditions were right for innovative approaches to inventory control. The Japanese were having successes with JIT purchasing and production techniques. Those successes were being discovered by American companies and discussed in the business literature. Since the mid-seventies, JIT purchasing has become the rule rather than the exception in the U.S. The following section contrasts the elements of a JIT purchasing operation with a traditional purchasing operation.

E. THE ELEMENTS OF JIT

Purchasing activities generally include all of the functions involved in the procuring of material, from the time need is determined to its receipt and use. These functions include: establishing lot size, selecting suppliers, evaluating suppliers,

negotiating with suppliers, inspecting incoming parts, determining mode of transportation, and setting product specifications. [Ref. 3:p. 28]

1. Establishing Purchase Lot Size

Under traditional and many Government purchasing operations, surplus items are ordered so that any disruption in supplies can be tempered by drawing down inventories. This ties up large amounts of investment dollars in inventories.

JIT purchasing operations are much different than traditional purchasing operations. The smaller the lot size, the better. The goal is to drive the lot size as small as possible, preferably piece for piece. This alleviates the need to tie up precious capital in inventories. Under the JIT purchasing practice, small lot sizes are important enough to overcome the obstacles of higher freight costs and loss of quantity discounts. [Ref. 3:p. 29] It is important to note that piece for piece shipping is not always the best case. If the costs of piece for piece shipping are greater than inventory costs, it may be better to hold inventory.

2. Selecting Suppliers

Selecting a supplier is generally the single most important decision a buyer can make. [Ref. 3:p. 29] In the traditional purchasing operation, many elements that could be used to select acceptable suppliers are not considered. The supplier is selected according to lowest price.

Under JIT purchasing, the buyer deals with a limited supplier base. The idea is to hone the supplier base to only those suppliers that are necessary to meet the business'

objectives. With the business relying on fewer suppliers, a close relationship must be established between the organization and the supplier.

Since the supplier is outside the producing organization, the buyer-seller link must be extremely tight, both behaviorally and logistically, for the JIT system to function properly. Success requires modifying the traditional buyer-seller interaction, which placed emphasis on the adversarial role of the two parties, to one recognizing the need for mutual cooperation. [Ref. 31:p. 8]

In 1984, Burroughs began consolidating its supplier base. From 750 suppliers of production parts, it has whittled the list to 106 "preferred" suppliers. And today, purchasing not only visits suppliers' plants to check out their manufacturing capabilities, but also their suppliers' suppliers. Indeed, sharp cutbacks in supplier bases are being made everywhere that JIT is gaining a toehold. Xerox's purchasing department has swallowed the bullet almost in a single gulp, giving the pink slip to some 4700 of its suppliers in a single year. At Harley Davidson, the supplier base was trimmed from 320 to 180 over a two year period. [Ref. 33:p. 51]

In the JIT purchasing environment, suppliers play a critical role. They will not be willing suppliers unless convinced that the benefits of making the changes required to become a JIT supplier outweigh the costs. The JIT buying firm must take a proactive role in developing a reliable network of suppliers. [Ref. 22:p. 77]

In forging a close-knit relationship, a contract acts as the glue to hold the buyer-seller partnership together. Long term contracts help ensure that the relationship is long lasting. Companies are reversing their normal policy and offering long-term contracts to their key JIT suppliers. Currently, three out of every four purchasing dollars go to key suppliers under long-term contracts. [Ref. 32:p. 64]

Once suppliers have been selected, the purchasing department needs to evaluate feedback to ensure the ongoing relationship remains effective. This leads to the next area for purchasing to consider.

3. Evaluating Suppliers

Evaluating supply sources is another important, continuing process in a good purchasing department. Purchasing management defines its objectives in terms of meeting manufacturing material requirements with the best price, quality, and delivery. Naturally, management would like to know how it is doing in relation to its goals. [Ref. 1]

Under traditional purchasing practices, each shipment sent to the distribution point is checked to ensure contract performance. Based on this inspection, grades are given and tabulated on a monthly basis. The result is an after-the-fact compilation of contractor performance.

Under JIT purchasing, attention focuses on maintaining a good buyer-supplier relationship. [Ref. 3:p. 33] Specifically, JIT purchasing practices emphasize product quality, supplier relationships, delivery performance and price. This order is the order of importance for JIT. Under traditional purchasing operations, and for most Government purchasing operations, price would receive the highest emphasis.

It may seem highly suspect to put price so far down the ladder of importance, but under JIT purchasing the goal is a zero reject rate and 100 % on time

delivery. This goal, which is met far more often than not, results in savings not only for the buyer but the seller as well.

Traditional purchasing operations allow an acceptable amount of quantity and quality rejects. This may explain why the best Japanese suppliers had .003 percent unreliability and the best American supplier a 1.8 percent unreliability. [Ref. 37:p. 24]

The method used for evaluating suppliers can be as varied as the products they produce. Very complex items or higher dollar value items may require a different evaluation scheme than low value off-the-shelf items. Although numerous types of supplier evaluation programs are currently used in the United States, most possess three distinct features for assessing and controlling quality. These include: checking the supplier's record for each shipment to determine if product specifications have been met; tabulating a monthly or quarterly rejection percentage for the suppliers' material; and scheduling a regular review by the buyer, supplier and the engineering department. [Ref. 34]

The bottom line in evaluating suppliers is to tailor the evaluation to directly support JIT purchasing goals. Traditional methods emphasizing price are of little benefit in a JIT purchasing operation. Evaluations that strengthen the buyer-seller relationship and that focus on quality are the cornerstone of a JIT purchasing evaluation scheme.

4. Negotiating With Suppliers

Another area of acute difference in traditional and JIT purchasing is negotiating with suppliers. Under a conventional purchasing system, the buyer tends to deal with

multiple suppliers and grants the contract or purchase order to the lowest bidder. The purpose of dealing with multiple suppliers is to obtain the lowest price. Most buyers provide exacting and rigid standards so that the price becomes the basis for decision.

In JIT purchasing, the buyer is less concerned about lowest price and is more concerned about the parties' long-term relationship. The supplier most likely to be awarded the contract is the one who can provide consistently high product quality with no incoming inspection, deliver on time, work with the buyer to solve problems, and agree upon a fair price for both parties. [Ref. 3:p. 34]

Under JIT, bidding specifications are less rigid, allowing the supplier to be more innovative in meeting the buyer's needs. The buyer then visits the supplier's plant to go over the bid in detail. As a team, the supplier and buyer reach an agreement. In Japan, customers may not lay a detailed cost estimate on the negotiating table, but they are expected to be very open to recommendations for improving the cost and quality of parts and materials supplied. The supplier has good assurance that information divulged to customers will not be used to take business away from the supplier. The relationship is one of mutual assistance; suppliers are expected to assist customers in any way possible. [Ref. 27:p. 206]

With a long term commitment between buyer and seller, it becomes unnecessary for suppliers to re-bid every time a requested item is needed. This saves time and money in the long run.

5. Inspecting Incoming Parts

Under traditional purchasing, the receiving department is responsible for receiving, identifying, counting, and inspecting all inbound freight. [Ref. 3:p. 34] This puts the burden on the buying company to check performance.

Under JIT purchasing, incoming inspections are unnecessary. The supplier performs the inspection and due to a close relationship between the buyer and seller. The buyer can depend on the supplier's quality. The only time inspection is required is when an item or supplier is being used for the first time.

The process that allows companies to forgo receipt inspection of incoming parts is supplier certification. Supplier certification involves a five phase process. [Ref. 23:p. 55]

Phase one reviews the supplier's ability to meet quality. This may entail inspecting a first article, reviewing part quality, isolating production line errors or any procedure that allows the buyer to isolate problems in the supplier's quality control. [Ref. 23:p. 56] One of the benefits in JIT purchasing is a reduction in the number of quality inspections. This reduction takes place when the buyer is convinced that the supplier has a system in place to produce quality parts.

Phase two is an on-sight evaluation of a supplier's production process. This visit examines the supplier's assembly and manufacturing operation and makes recommendations as to how the process can be done more cheaply or more efficiently.

This review is performed by a multi-disciplinary team of buyers/ planners, design engineers, production engineers and quality control personnel.

After the visit, a memo outlining recommendations is presented to the supplier for action. If the supplier is unwilling to make the recommended changes, the certification process ends there. If the supplier is willing to make the recommended changes, the buyer's certification team will work with the supplier to make necessary improvements. This team approach is a cornerstone of JIT purchasing.

Phase three is the finalization stage. The buyer and seller agree that all actions in the evaluation memorandum have been followed. The buyer and seller also agree on how to handle incoming inspections until full certification is achieved. {Ref. 23:p. 58}

Phase four is the certification phase. This is the point where the buyer approves the supplier's process. A ceremony is recommended to emphasize the bond the supplier and the buyer have forged through the certification process. [Ref. 7:p.15]

The fifth and final phase is on-going audit and maintenance. This phase requires periodic audits of incoming material. If the supplier experiences discrepancies that are not systematically corrected, decertification may be required.

The complete certification process becomes a bonding of buyers and suppliers and is a key element of JIT purchasing. According to a Purchasing Magazine survey, 74% of firms polled have a certification process for their suppliers. [Ref. 32:p. 58]

6. Determining Mode of Transportation

Traditional purchasing approaches rely mostly on the supplier and transportation company to determine how to ship products to the buyer. In most traditional purchasing organizations, the manufacturing organization is only concerned with outbound shipments; effectiveness of this is measured by how much the traffic manager can save in transportation charges. [Ref. 3:p. 35]

In JIT purchasing, on-time delivery is of paramount importance. Because of this, the buying organization's traffic manager is responsible for inbound as well as outbound shipments. To meet JIT delivery requirements, delivery dates and times, types of carriers, routing decisions, and shipping processes must be designated by the buyer. [Ref. 3:p. 36]

7. Setting Product Specifications

According to traditional purchasing practices, engineers spend a great deal of time and effort specifying and developing tolerances for almost every conceivable design feature of the end product. Purchasing people review purchase requests to make sure all product specifications are defined. Once the request is sent, the supplier is tasked with following the specifications. [Ref. 3:p. 36]

Under JIT purchasing, the buyer seeks advice and assistance on technical matters from suppliers in order to design better parts, achieve lower price, and improve product quality and productivity. The buyer relies more on the suppliers' performance specs and less on narrowly defined design specs. [Ref. 3:p. 36]

F. BENEFITS OF JIT PURCHASING

Having a new management philosophy is not the "be all" and "end all". If benefits are not forthcoming then a new management philosophy provides no value added. JIT purchasing generates many measurable benefits. The following section lists the benefits derived from an effective JIT purchasing operation:

1. Cost of Parts

- Low inventory-carrying costs
- Decreasing cost of parts because of long-term learning curve benefits from long-term relationships
- Low scrap cost, since defects are detected early

2. Quality

- Fast detection of defects, since deliveries are frequent
- Fast correction of defects, since supplier setups are frequent and lots are smaller
- Less need for inspection, since process control is encouraged
- Higher quality of parts purchased - and of products in which they are used.

3. Design

- Fast response to engineering changes
- Design innovativeness, since supplier expertise is not hamstrung by restrictive specs

4. Administrative Efficiency

- Few requests for bids
- Few suppliers with which to contract
- Contracts negotiated infrequently
- Minimal release paperwork
- Little expediting

5. Productivity

- Reduced paperwork
- Reduced inspections
- Reduced delay because of off-spec parts, late deliveries, or delivery underages
- Reduced purchasing, production control, inventory control, and supervision, with more reliable parts provisioning and smaller inventories. [Ref. 35:p. 160]

Abdolhossein Ansari, a noted JIT advocate, surveyed 31 companies concerning the benefits of JIT purchasing. The results are presented in Table 3-1.

As can be seen from the table, JIT purchasing can provide real benefits for those companies in which it is implemented. The following section shows the elements DLA has derived from commercial JIT purchasing and modified to fit Government purchasing.

G. DOD JIT PURCHASING

As mentioned in chapter two, DOD has made some progress in lowering inventories. Some of this reduction has come about through property disposal and public sales. Additional decreases have come about through revaluing the inventory and from better inventory management practices. Although DOD is taking steps to manage its inventory more effectively and economically, major changes are needed at all levels of the inventory system. These changes will translate into significant savings. DOD's top management will need to change its organizational culture to eliminate overstocking, rapidly adopt commercial practices where commercial supply and distribution systems

Table 3-1. Current and Anticipated Tangible Benefits of JIT Purchasing

<u>Benefits</u>	<u>Pre-JIT</u>	<u>Current</u>	<u>% Improvement</u>	<u>Future</u>
Scrap cost as a percentage of total purchase dollars	9.7	5.9	40%	1.5
Purchase item inventory as a percentage of total purchase dollars	46.5	32.1	31%	21.6
Vendor response time to implement changes (days)	39.0	28.0	28%	19.0
Percentage of buyer time spent on expediting	33.0	23.0	30%	10.0
Purchase material turnover during a given period	6.7	13.2	97%	24.4
Percentage of delivery promises met	67.4	82.7	23%	97.6
Average delivery lead time (days)	77.0	64.0	17%	23.0

Source: From Ref. [3]

are well established, implement and monitor improved performance measures that stress cost effectiveness and inventory reduction, and improve computer systems to accurately reflect inventories and requirements. [Ref. 21:p. 31]

The Defense General Supply Center (DGSC) has been the premier organization in implementing commercial JIT purchasing initiatives. DGSC started its first commercial JIT initiatives in 1983 with the paperless order placement system (POPS).

In the 1980's, Kodak approached DGSC with an electronic order processing concept. Under this program, DGSC would send orders via a direct computer-to-computer link. The paperwork, which was becoming fairly substantial, would be eliminated in this process as would many of the other associated order processing tasks. Kodak distribution facilities would ship directly to the end user, providing a fresher product, improved delivery and reduced transshipment costs for DGSC. This gave birth to the paperless order placement system (POPS). For the initial trial period, a variety of frequently ordered products were placed on requirements type contracts (RTCs). These initial RTCs covered a base year with 12/24 month renewal options. Most National Stock Numbers (NSNs) requested and under contract were sole source to Kodak. As time went on, competitive solicitations were issued and rolled into the POPS concept. A variety of vendors became involved in POPS and long-term contracting concepts. [Ref. 9]

The start up cost for POPS was \$62,158; tangible savings were estimated at \$19.1 million in the first year. [Ref 28] The POPS program has maintained a steady growth since its inception.

In 1993, with a decade of success in the POPS arena, the Director, Defense Logistics Agency directed all of DLA to initiate a Buy Response Vice Inventory Program

(BRVI), to lower inventory levels throughout DLA. The BRVI program, a variant of commercial JIT purchasing, has met with great success at the Defense General Supply Center (DGSC). The following discusses the BRVI program.

H. THE ELEMENTS OF THE BUY RESPONSE VICE INVENTORY PROGRAM

In establishing an inventory reduction program, the Government could follow commercial procedures. This could prove difficult for DOD however. DOD's difficulty stems from the Government's procurement requirements, some of which are based in Federal laws that are intended to serve a variety of objectives, including supporting social and economic programs, full and open competition, and purchasing items at the lowest unit cost. The private sector places few, if any, restrictions on the sources a firm may use. For example, a commercial firm is not required to conduct competitions for its contracts and, if it does so, it may use whatever process it deems appropriate. The Government, on the other hand, must compete contracts unless restrictions on competition have been justified. The Government must generally follow a formal, complex, and time-consuming process with which commercial firms are not familiar.

[Ref. 20:p. 42]

Another complication in adopting the commercial approach is the perception that supplier relationships are inconsistent with the tenet favoring arm's length Government-contractor relationships. Convincing those in authority that good supplier relationships and an arm's length posture are compatible may be difficult. [Ref. 10:p. 4-2]

Suffice it to say, examining of the Government barriers to commercial practices could be a lengthy research topic and will not be addressed here. In fitting the Government commercial practices initiative within the statutory and regulatory guidance, the following elements are compatible with commercial initiatives:

1. Long-Term Contracting

Long-term contracting is fast becoming the preferred method of contracting in many instances and is essential for the Buy Response Inventory Program. It is a way for the Government to establish the long-term relationship that is vital to commercial JIT purchasing. Long-term contracting is a method to process repeated requirements for the same items over a specific period of time, not to exceed five years.

Under a long-term contract, DLA agrees to purchase items from a supplier for one to five years. These agreements can be for a single item or for groups of items with common characteristics. Through these long-term contracts, DLA reduces the time it takes to complete the procurement process and inventory orders. DLA benefits from lower administrative and holding costs. In addition, long-term contracts provide for cost savings because suppliers and DLA share benefit from an increase in volume and business stability. [Ref. 16:p. 30]

Long-term contracting has allowed purchasing operations to forge a much closer operational relationship with a supplier while maintaining the arm's length relationship that is needed in the Government purchasing arena. Chapter V describes the contract

types and procedures that can establish long-term Government contracting. The following is a brief example of how a long-term contract would work for a Government purchasing operation.

The Government has a requirement for a product such as "C" batteries. In the past, as each request for batteries is processed, the items are supplied from the supply center's inventory or purchased under a contract to fill the requester's need. If the supply center receives a large number of requests for "C" batteries, a large inventory must be held or many contracts are let to fill these requests.

Under a long-term contract scenario, an indefinite quantity contract (IQC) is let to a battery supplier who has responded favorably to a solicitation and been awarded the LTC. An IQC is a long-term contract. As requests for batteries are received by the supply center, they are ordered from the supplier and delivered. This is done as often as necessary. Only one contract need be let; the subsequent requirements for batteries are satisfied from the same supplier through a delivery order.

This system reduces paperwork because only one contract is let. The IQC can run for a number of years and the supplier can reap the benefits of a minimum guaranteed quantity, allowing longer run production planning. Most importantly, from an inventory standpoint, requirements are ordered as needed. Inventory is dramatically reduced. The key to this long-term contracting process is the ability to interface with the supplier electronically. This leads us to the next element, Electronic Commerce/Electronic Data Interchange (EC/EDI).

2. EC/EDI

Electronic Data Interchange (EDI) is the computer-to-computer exchange of standard business documents such as purchase orders, invoices, and receiving reports by means of standard format called transaction sets. [Ref. 4:p. 1] Using EDI, commercial businesses and the Government can replace the time consuming and repetitive process of manually handling large volumes of standard business documents with an instantaneous, single-entry exchange of digital information between computers. [Ref. 4:p. 1] EC/EDI is being used and developed throughout all levels of the Government. Computerized orders may be placed with a supplier at the speed of an electron. This not only saves paperwork, it reduces the lead-time to deliver an item. [Ref. 25]

DGSC used EC/EDI when its POPS initiative was developed in 1983. When POPS was developed, it was initially for order placement. In today's Government EC/EDI environment, the intention is to perform all transactions via EC/EDI. This would include publishing solicitations, receiving proposals from suppliers, making notices of awards and performing all previous manual actions via computer links to the suppliers. [Ref. 12:p. xvii] Chapter V describes the specifics of EC/EDI.

Once the contract vehicle has been established and the process has been electronically performed, the final stage of the process is delivering the item. For the BRVI process, the final element is Direct Vendor Delivery (DVD).

3. Direct Vendor Delivery

As mentioned earlier in this chapter, commercial JIT purchasing involves inbound and outbound shipments. Under the Direct Vendor Delivery (DVD) element, the Government purchasing operation eliminates outbound shipments and has shipments of supplies directly delivered to the requesting activity, thereby bypassing the Government warehouse.

One aspect of JIT purchasing is frequent on-time deliveries. It may seem that frequent deliveries would increase transportation costs. However, in a Government purchasing operation using Direct Vendor Delivery, the increased costs of more frequent deliveries are more than offset by the savings generated by direct delivery. These savings include lower transshipment, warehousing, and warehouse release costs.

Another aspect of (DVD) is the time savings from shipping directly to the user vice transshipment from the warehouse. Transshipment adds time to receive, sort, reload and administratively coordinate the transshipment. Taking the Government out of the transshipment role, generates time and cost savings. Additional information on Direct Vendor Delivery will be presented in Chapter V.

I. SUMMARY

JIT purchasing, the vehicle that allows for an uninterrupted flow of supplies through a distribution point, has been credited to the Japanese. However, its basic elements were practiced in the U.S. during the early 1920s. The events of the 1970s and 1980s, from excessive inflation to the oil embargo, motivated companies to reduce

costs to offset the detrimental economic conditions. During this time, the U.S. began to focus on JIT purchasing and its success in Japanese companies. Companies that have implemented JIT purchasing have experienced lower costs, increased quality, design innovativeness, administrative efficiency and increased productivity.

DLA, recognizing the benefits of JIT purchasing, started an initiative called the Buy Response Vice Inventory Program (BRVI). This is a modified commercial JIT purchasing process. Its elements include: long-term contracting; EC/EDI and Direct Vendor Delivery (DVD).

Chapter IV provides the results of a questionnaire sent to various suppliers who are engaged in the BRVI process at DGSC. It highlights problems and successes in the BRVI process.

IV. CONTRACTOR QUESTIONNAIRE RESULTS

A. INTRODUCTION

This chapter presents the results of a questionnaire sent to ten contractors currently involved in the Buy Response Vice Inventory (BRVI) program, the Government's JIT purchasing initiative at DGSC. By presenting this information the reader will become familiar with some general concerns ranging from how contractors are approached about beginning JIT purchasing with a Government organization to the current state of JIT purchasing within contractor companies.

The discussion includes opinions concerning listed responses and in some cases other recommendations to counter a contractor problem. Many of the responses delve on subjects that are outside JIT purchasing implementation and are intended for informational purposes only. This chapter highlights contractors' concerns and presents issues that may be considered when implementing JIT purchasing. Chapter V presents guidelines and recommendations for implementing JIT purchasing.

The companies solicited for comments represent a cross-section of companies with divergent product lines and are leaders in their respective product niches. All ten companies solicited responded to the questionnaire. The companies responding are: Eastman Kodak Company; Eveready Battery Company; South Coast Terminals Incorporated; Rayovac Corporation; 3M Company; National Draeger Incorporated;

Grimes Aerospace; General Electric Lighting Company; Mine Safety Appliance Corporation; and Nolco Products Corporation.

In presenting the questionnaire results, references to the companies' name are not provided and only the responses pertinent to the thesis are listed. Common responses are summarized in one entry.

B. QUESTIONNAIRE RESULTS

1. Are you familiar with Just-In-Time Manufacturing/Purchasing?

This question determines if the companies with which the Government is dealing in a Just-In-Time environment were familiar with JIT outside the Buy Response Inventory Program (BRVI).

One hundred percent of the contractors responded that they were familiar with JIT manufacturing/purchasing. Eight of ten contractors responded that JIT purchasing/manufacturing are used in their companies' operations. This may lead purchasing offices to rely on companies with whom they do business, to help in the implementation process. Contractor expertise should not be overlooked during JIT implementation.

2. How did your company become involved with the long-term contracting process with the Defense General Supply Center?

This question identifies how the contracting activity informed contractors about their long-term contracting initiatives. This is an attempt to discover both if a marketing effort was necessary to inform contractors of the Buy Response Vice Inventory program

and if the contractors had any comments regarding how they were contacted to participate in the long-term contracting initiative.

Eight of the ten respondents acknowledged that the long-term contracting process was a continuation of a long-term relationship for providing DGSC products on a continuous basis. Two of the contractors stated that they became aware of DGSC's JIT initiatives during an annual supplier's conference held by DGSC and sponsored by the local National Contract Management Association (NCMA) chapter in Richmond, VA. Four of the respondents stated that they inquired about becoming involved with the Paperless Order Placement System (POPS), an element of BRVI, because of their desire to improve their own operations. They were motivated by successes experienced by Kodak, the POPS program initiator.

Based on the questionnaire replies, it appears that several methods have proven effective for advertising the opportunities in long-term contracting. Much of the success in advertising came from established relationships with contractors or through the solicitation process. Two of the contractors were advised of long-term contracting initiatives through a supplier conference held in association with the NCMA.

3. What were your biggest concerns about entering into long-term contracts with the Defense General Supply Center? Were your concerns realized?

This question revealed what the contractor viewed as potential problems before entering into a JIT purchasing relationship with DGSC. It also determined if the perceived problem actually occurred or whether their concerns were unfounded.

Six of the ten contractors were concerned about the effects long-term contracting had on item pricing. During the course of a long-term contract, which can run up to five years, the cost of manufacturing an item can increase. Without increasing the price, profits can decrease until it becomes a drain on revenue to sell the item at its initial price.

Four of the six contractors reported that an economic price adjustment (EPA) in the contract alleviated their concerns because the price could be adjusted annually up to an EPA cap. However, two of the respondents said that the EPA cap was set lower than necessary to maintain a profit on some items they supplied. The items were sold at prices lower than those for which the same item sold commercially.

An EPA clause is effective in ensuring that the contractor's pricing policy remains consistent with its commercial pricing. For the limited number of cases where the EPA clause is insufficient to ensure a profit on a supplied item, the contractor should supply the contracting officer with the documentation to support a higher price increase so both parties can negotiate a modification on a new price change.

Half of the respondents were concerned with product changes. This included product obsolescence and technology changes. In the commercial market place, products change as new technologies emerge. Products are often updated to make them better or more effective than competing products. Under a long-term Government contract, the item listed on the contract may be several years old and in need of updating to remain commercially competitive. The company may be faced with maintaining two products, one for the Government and one for the commercial sector, or changing the

Government product and bearing the increase in cost due to changing the product. Since this cost increase is due to product development and not to economic conditions, a price increase under the EPA clause is not warranted. Initially some of these problems were realized, but a clause covering product changes allowed the contractor to continue product development, make necessary changes and provide the updated product to the Government with new negotiated prices.

Half of the contractors questioned were also concerned with product obsolescence. Over time, some products lose their commercial appeal and the Government is the only market. If the Government purchases only a limited amount, the product becomes too costly to maintain and should be discontinued. Again, a clause allows those items with little or no commercial appeal and low Government demand to be discontinued. This has proven to alleviate contractors' fears.

One of the respondents was concerned that expected demand fluctuations would be a problem. On requirements-type contracts, an expected quantity is specified so the contractor can plan on a certain sales volume during the life of the contract. Expected quantity values are not promises to purchase but forecasts of expected purchases during a contract period. This particular contractor's fears were realized. The expected order quantities were grossly overstated when compared to the amount actually ordered.

There is little remedy for this situation. It bears noting that the contracting officer should be as accurate as possible in listing expected purchase quantities. Available usage data should be routinely used in estimating demand for the contract term.

Two contractors were concerned about the limitation long-term contracting imposes on competition. The longer the contact, the less often a contractor gets to bid for new business. Increasing competition is still a valid goal in Government contracting. However, commercial initiatives in the Government sector must balance competition and good business practices. Long-term contracting does limit competition but in many cases uninterrupted supplies from a quality vendor at a fair price makes good business sense for the contractor and the taxpayer.

Payment problems were concerns for 30% of respondents. The payment system is currently being upgraded with electronic data transmission and the Defense Finance and Accounting Service organization realigned to better support the customer. Of the three contractors initially concerned with the payment process, only one has experienced any problem.

4. What do you see as advantages for entering into long-term contracts and JIT purchasing ?

This question determined what the contractor viewed as the advantage of long-term contracts and JIT purchasing. It is important for a purchasing office that is implementing JIT purchasing to understand the contractor's motivation for entering into a long-term relationship. Understanding a contractor's point of view may help the buying organization sell the JIT initiative.

Sixty percent of those surveyed acknowledged that reduced paperwork and administration was a primary advantage of a JIT purchasing initiative. Preparing a

vendor's solicitation does involve substantial effort. It is beneficial to obtain the longest term of coverage. Since some of the solicitations contain several hundred items, much paperwork is generated. Under a long-term contract, there is no requirement to process additional solicitations for each item requested. This saves the excessive paperwork required to prepare numerous bids. In the area of administration, negotiations are usually held once during initial contract formation. Since the subsequent items requested are on a long-term contract, additional negotiations are no longer required.

Four out of ten contractors stated that long-term contracts allow for better planning in their companies' production, distribution and purchasing operations. Because a production line can be established on a multi-year basis, manufacturing plants can optimize production rates, insure familiarity with production processes, and achieve higher levels of quality. All these factors help reduce manufacturing costs; savings can be manifested in lower prices.

Thirty percent of contractors stated that long-term contracting relationships allow for a more stable sales environment which promotes increased revenue.

One contractor noted an often overlooked advantage of purchasing commercial items in a long-term contracting environment. Products purchased by the Government are used by both civilian and military personnel. Continual use ultimately leads to brand recognition. With a long-term contract, the contractor may supply an agency's need for many years. A loyalty develops between the user and the producer.

An additional advantage was noted by a contractor but realized by the Government. JIT purchasing, with direct delivery, allows date sensitive products, like batteries and film, to be delivered in fresher condition. This ensures less quality problems for the user and improves the buyer seller relationship.

5. What would you change about the long-term contract process to make it better for the contractor ?

This question determined how the process could be changed to improve its effectiveness from the contractor's point of view. The buying office must remember that any improvement which benefits the seller might have the opposite effect on the buyer. Knowing how the seller views the implementation results may help a buying organization tailor their JIT purchasing implementation to enhance the process and improve the implementation effectiveness.

Forty percent of the respondents were concerned with the EPA provisions of the long-term contract. They believed EPA provisions should be tied to the standard commercial pricing processes, not the Government index. Contractors that manufacture and manage inventories on a world-wide scale felt the Government's EPA index is invalid.

This particular concern may be valid. The Government is attempting to move more toward commercial initiatives. The commercial sector bases prices on commercial market forces. These include the cost of manufacturing and competitive pricing. If the

Government does not allow companies to price their items sold to the Government in a manner consistent with their commercial markets, it inhibits profits and may restrict competition.

Three of ten contractors felt that using the Federal Acquisition Regulation (FAR) was unduly structured and tedious. They recommended that the Uniform Commercial Code (UCC) be substituted. The battle over the use of the FAR has been waging since its inception. The FAR poses a problem for Government policy makers as well. At present, decisions are being made whether to completely rewrite or to amend the FAR. However, the FAR will continue to guide Government purchasing for the foreseeable future. Government purchasing offices need to pare down solicitations and cut the number of clauses to the minimum required to manage risk. In contrast, commercial product purchasing is much less structured. FAR clauses that add no value to a commercial purchase should be eliminated.

Twenty percent of the contractor respondents complained of the excessive time it takes for Government purchasing offices to award contracts. As EC/EDI becomes the standard for submitting solicitations and offers, the time for the submissions should decrease. However, contract awards are not EC/EDI sensitive. Decisions to award contracts still require human interaction. Streamlining the award process is very important in Government contracting. Most of the time savings from EC/EDI is in solicitation and offer. If no time is saved in the award process, little overall time savings

can occur. Recommendations to reduce award decision time frames are beyond the scope of this thesis, but it remains a problem and is a concern to the contractor.

The following items were only mentioned by one respondent. They show no pattern of a systemic problem but will be listed and discussed briefly.

One respondent suggested using ISO-9000 in lieu of the MIL-Q-9858. ISO-9000 is a universally accepted commercial program to let buyers know that the company from which they are buying has controls and systems in place to ensure their product meets an expected quality level. The Government ensures this using Cost/Schedule Control Systems Criteria C/SCSC, MIL-Q-9858 and MIL-I-45208. Since ISO-9000 is becoming the international standard, and the Government is shifting to commercial practices as much as possible, ISO-9000 seems a logical move as a universal quality program.

One contractor recommends that contractors be allowed to remove or add items from a long-term contract when necessary. This appears to be a valid point. Generally, contractors have numerous products on one long-term contract. If a product under the contract becomes commercially non-viable, it must be carried to meet Government requirements. Conversely, improved or new products should be added to a contract when necessary. A modification could be used to add or remove items to an existing long-term contract. This allows for modernization when necessary.

6. Were there any technological problems associated with entering into JIT purchasing / long-term contracts, such as compatibility of computer systems or software for placing orders? If problems existed, were they easily corrected?

As discussed in previous chapters, electronic data interchange (EDI) is an important element of Government JIT purchasing. This question identifies if EC/EDI posed a problem when implementing JIT purchasing. The second part of the question is to uncover the extent of the problems and to discover how much effort was required to overcome them. The responses may help purchasing offices side-step problems when implementing JIT purchasing.

Generally the technological aspect of implementing JIT purchasing was less problematic than one might expect. Most problems were specific to an individual contractor. For example, one contractor was concerned because they deal with numerous Government agencies and some of the agencies field different computer systems. This required the contractor to set up separate systems so they can transmit data to different agencies. This problem is recognized within DOD and is being addressed at all levels. The DOD Electronic Commerce (EC)/ Electronic Data Interchange (EDI) in Contracting Report of 20 December 1993 addresses compatibility, and all current issues should be resolved by January 1996. Additional examples of problems encountered during JIT implementation follow:

- One contractor began receiving orders that were not part of their contract but were intended for a competitor.
- One contractor had transmission problems that were corrected by using a Value Added Network (VAN). A VAN provides connectivity from a contractor computer system to the Government computer system through a third party interface.
- One contractor was concerned because the Government requirements for data transmission were somewhat antiquated. The Government required a 2400 baud modem and a DOS communication package to receive contractor input. These parameters are behind state-of-the art and take an unusually long time for transmission.
- After awarding a contract, the buying office begins EDI transmissions. Contractors which accept incoming transmissions and perform pricing functions can not load their system with the new award information until they receive a formal copy of the contract. If incoming orders are not recognized by the contractor's system, the order will be rejected. The buying office and supplier must agree on the start dates for EDI transmission; they should be determined by days after the supplier receives award.
- Contractors have POPS contract and BPA contract numbers that have the same last five digits as other POPS contracts. Many contractors use the last four digits as a way to distinguish between contracts. This results in rejected orders. The buying office must be aware of how the contractor system handles contract and order information. Preliminary planning in this area can avert associated future problems and ensure a more effective implementation. This should be resolved during test transmissions.
- Pricing errors, typos and omissions associated with the contract set-up and the pricing process are not identified or corrected in a timely fashion. There are no verification processes for the contractor or the Government to validate the accuracy of each other's contract data files. This results in undetected errors which causes billing and collection problems, excessive correspondence and modifications. This problem can be corrected by running a test transmission. Any discrepancies found should be reported to the EDI transmission office for correction.

- Incoming transmissions contain new DODAAC (Department of Defense Automated Addressing Code) information for which the contractor has yet to assign a customer number. The DODAAC information tells the contractor where the shipment needs to go. If the ship-to address does not cross to a contractor's customer number, it appears as an unrecognized DODAAC and the order rejects, causing delays. This is prevalent for first-time ship-to locations. This can be overcome by the buying office screening orders for DODAAC locations which do not have customer numbers. The contractor needs to routinely provide the list of customer numbers to the buying office so screening can take place. When a new DODAAC is used, the buying office should contact the supplier so a customer number can be generated prior to order processing. Once a trial order submission is generated any problems can be corrected.

7. Just-In-Time purchasing is a process that uses numerous, low-volume purchases to preclude the need for the buyer to maintain and carry large inventories and the associated infrastructure cost. Has this process changed the way your company maintains its own inventory?

This question gives the JIT purchasing implementing activity an idea how JIT affects the contractor. Acknowledging that the buying activity affects contractor operations ensures that decisions during implementation will consider both parties' interests. This should eliminate the "us-them" mentality so prevalent in Government purchasing.

All of the respondents acknowledged that JIT purchasing has directly affected the way they maintain their own inventories. For example, any manufacturer who wishes to competitively supply high volume manufactured or packaged products must control inventories of raw materials and finished products. Relaxing this principle will allow products to become out-of-date and obsolete. The money required to carry or hold large inventories must be released to other uses if a company wishes to maintain a competitive and profitable position. Company funds used to purchase excess raw materials and

finished products take available monies from other operating and required expenses, they may force small companies to borrow funds. This interest expense cost is a direct offset to profit and will ultimately produce a non-competitive result.

Over the past few years, contractors have gradually changed and improved the ways in which they maintain and control inventories, using personnel and mini-computers. Contractors have modified existing inventory control systems to accommodate the changes imposed by Government JIT purchasing. JIT has changed the way the contractor handles inventory. It ultimately allows a contractor to better prepare forecasts which helps in planning for resource utilization. This makes cash flows more predictable and holds costs down.

C. SUMMARY

Chapter IV highlighted responses to a questionnaire concerning the contractors' views of JIT purchasing. This information should help the implementation process discussed in Chapter V. This section has raised some issues that must be addressed for a JIT purchasing operation to run more smoothly. The intent is not to recommend unique resolutions. Each organization may follow different procedures and the end result can still be effective. Better implementing decisions can be made with the knowledge of the problems that can occur and the effect of JIT implementation on contractors.

V. IMPLEMENTING JIT PURCHASING

A. INTRODUCTION

The previous chapters explained why JIT purchasing is essential in today's environment of reduced budgets and increasing oversight. They also listed those elements that are considered important for an effective operation and the experience a cross-section of contractors have had in teaming with the Government in a Just-In-Time purchasing environment. This chapter speaks to implementing JIT purchasing including: the considerations prior to implementation, the barriers to implementation, and the implementing elements. This chapter may be used as a guide for agencies outside of DLA when considering starting their own JIT purchasing operation.

There should be no question about the significance of any implementation process. A plan that falls prey to faulty implementation can find itself far short of the vision of its authors, even to the extent of total failure. Some feel the question of implementation is one of the most fundamental of all issues that large-scale organizations face. [Ref. 30: p. 160]

Implementation of JIT purchasing may differ from agency to agency but common processes can help ensure an effective implementation. Treating the implementation in three phases is a way to ensure a smooth transition from traditional purchasing to JIT purchasing.

In phase one, the purchasing operation experiments by incrementally reducing inventories, eliminating waste, exposing problems, and responding immediately to them. [Ref. 3:p. 48] Bringing down inventories slowly will uncover useful information about lead times, transportation and customer demands.

Phase two consists of pilot programs. Typically, the pilot program begins by using a few local suppliers that deal in a few national stock numbers (NSNs). In this phase, a low volume, high dollar item is preferred. Success of the pilot program depends on how well the implementation was conceived and how well the various organizations interface to make the transition smooth. [Ref. 3:p. 48]

The final phase is full implementation. This phase occurs after successes in phase two indicates there are few hurdles to including additional NSNs. In this phase, the process is adjusted to make bringing new NSNs into the system routine.

B. CONSIDERATIONS PRIOR TO IMPLEMENTATION

Prior to implementing a JIT purchasing operation, several factors must be considered. These include: type of products being purchased, centralization in the project office, commitment of top level management and employee training and education.

1. Type of Products Being Purchased

When implementing a JIT purchasing operation, the organization must first characterize the products it buys. Not every purchased product lends itself to JIT purchasing. Commercial off-the-shelf (COTS) and low value consumable items lend

themselves to JIT purchasing more than low volume complex items. This is best represented by the differences that DLA supply centers encounter between their high volume and unique products.

DGSC in Richmond, VA is having great success with the BRVI program due in part to the nature of the items they buy. Many of their line items are consumable items that lend themselves to commercial purchasing initiatives. On the other hand, other supply centers have not experienced the same successes; not from lack of effort, but because the products they manage are appropriately bought under a traditional purchasing operation. [Ref. 25]

If a buying organization deals with repetitive, low cost, high volume items, then JIT purchasing may be more effective. Every buying office should review the items it manages and identify those that are candidates for JIT purchasing.

2. Centralization vs Decentralization

In the planning stages prior to implementation, the organization should consider whether to adopt a centralized or decentralized JIT purchasing effort. In a centralized organization, a single office purchases all items identified as appropriate for JIT purchasing. In a decentralized organization, each office is responsible for conducting JIT purchasing for the particular NSN under their control. If a buying organization has 10 separate product centers, then the organization will have 10 product managers implementing JIT purchasing.

At DGSC, the Buy Response Vice Inventory (BRVI) initiative is decentralized. It has had some consistent successes. The BRVI initiative is not a singular office that is staffed-up to handle all the initiatives such as corporate contracts or EDI. There isn't a core group that receives all BRVI projects and carries them through to fruition. Instead, the BRVI initiative team leader communicates with each one of the eight product centers as needed to promote BRVI initiatives. The decentralized responsibility ensures that BRVI permeates the entire organization rather than creating a niche group for that function. [Ref. 25]

None of the research has indicated whether a decentralized or centralized organization is better to implement the JIT purchasing initiative. Implementation planners should consider both and fit the form in their organization.

3. Top Level Commitment

No fundamental change in an organization can be successful without full top level management support. Like most company wide programs, a JIT strategy requires top management commitment and understanding. Top management must be informed so they will know what to expect from the strategy, as well as what is expected of them for successful implementation. [Ref. 5:p. 16]

Prior to implementing JIT purchasing, top management must recognize several factors. First, top management must understand that JIT is not just a series of techniques. It is a philosophy which requires the support, commitment and participation of human resources at all organizational levels. It also requires fine-tuned planning

across departments and careful coordination with outside companies. Second, implementing JIT is not a one-time effort with a distinct beginning and end. It is a continuous process. Third, implementing the JIT purchasing philosophy involves fundamental changes in corporate culture, human resources, training programs and internal organizational structures. [Ref. 2:p. 12]

4. Employee Preparation

Employees are the most important element in any organizational change. The employees are the organizational members that carry-out change. Every project is doomed to failure without employee support. When implementing JIT purchasing, employees must be adequately prepared through training and education. Education is learning the theory behind what you are doing. Training is putting into practice what you have learned. [Ref. 23:p. 147]

Prior to implementation, top management should prepare employees for the goals and objective of JIT purchasing through extensive education. All organizations have an inherent culture. JIT purchasing is such a radical change, the organizational culture must typically change. This is only accomplished through education, training and top level commitment.

C. BARRIERS TO IMPLEMENTATION

Prior to implementing JIT purchasing, it is imperative for all members of the organization to know the implementation barriers. Understanding the barriers early in

the process will help reduce the barriers and ensure a successful implementation. The following will describe the barriers and suggest solutions to alleviate their impact.

1. Lack of Supplier Support

The most significant problem in implementing JIT purchasing is the lack of supplier cooperation. [Ref. 3:p. 63] This is evident considering that JIT purchasing involves two elements: the buyer and the supplier. Although JIT purchasing is a pro-supplier program, many suppliers are reluctant to enter into JIT agreements for several reasons, including little or no incentive to adopt JIT delivery, lack of commitment from buyers, and considerable strain on suppliers.

Suppliers do not generally want to commit to JIT delivery unless they receive added compensation for their efforts. Without this compensation, suppliers have no incentive to switch from the traditional buyer-seller relationship. Furthermore, buyers don't typically give suppliers the commitment required for the JIT process. Suppliers have generally been treated as independent parties. Buyers often stimulate competition among several suppliers to minimize reliance on a single source. [Ref. 3:p. 63] JIT requires developing such a reliance. Finally, suppliers are not accustomed to continuous scrutiny from buyers. Under JIT purchasing, buyers constantly pressure them to deliver good quality in the right quantity on a continuous basis. [Ref. 3: p. 63]

There are at least two strategies that can alleviate supplier fears about entering into JIT purchasing. One is to ensure the supplier is involved in planning the JIT purchasing process. A buyer to supplier contact can facilitate this involvement. The

second strategy is supplier education and training. Education and training can help ensure that suppliers thoroughly understand the rationale for implementing JIT purchasing in the buyer's organization. [Ref. 3:p. 64]

2. Lack of Top Management Support

This area was mentioned in the section on considerations prior to JIT implementation; it is one of the key barriers. There are several possible reasons for lack of support. Management frequently forgets their long-term planning goals and concentrates on putting out fires of an immediate nature. This takes away the focus on implementation. An additional reason is skepticism. Some managers doubt the validity of JIT purchasing. They are easily frustrated with the magnitude of problems encountered during implementation and the sporadic benefits realized. [Ref. 3:p. 63]

There are at least two approaches to increase top management support: education and successful case examples. Education stimulates attitudinal changes across an organization. Education can take many forms, including visits to other organizations who have successfully implemented JIT purchasing and JIT workshops or seminars. These actions, coupled with documentation supporting JIT purchasing, can foster an atmosphere of change. [Ref. 3:p. 65] Additionally, publicizing the positive results experienced by other organizations can help convince managers that JIT purchasing is a smart investment. Many managers must see first hand that JIT can be used successfully before they are willing to provide the necessary support and leadership.

3. Lack of Employee Readiness and Support

This item is part of the considerations prior to implementation. Many employees simply do not understand JIT purchasing. Employees may not support the JIT implementation process if they are: resistant to changing habits, fear job loss and increased pressure and frustrated.

Employees who have performed a specific job repetitively for some years naturally find it difficult to change their perceptions and habits to coincide with a different conceptional environment. [Ref. 3:p. 68] Employees always fear that a new system threatens their jobs. Adjustments often require changing job descriptions, adjusting the workplace, adopting new skills, and in some cases, eliminating jobs. Finally, to successfully implement any new system, management must ensure employees adjust. JIT is no exception. The JIT concept requires individual employees to assume more responsibility for solving problems. That too causes frustration. [Ref. 3:p. 68]

At least two different solutions help overcome limited employee preparation and support. One approach emphasizes long-term, continuous JIT purchasing training for all relevant employees. These training programs should teach new technical skills and the basic JIT concept. [Ref. 3:p. 68]

The second approach uses a broader orientation focusing on the organization's reasons for adopting JIT and its underlying philosophy. Spending ample time educating employees about the importance of JIT to the organization's future success, increases

positive responses to the required changes. Everyone understands their role in achieving the organization's goals. Implementation problems can be reduced drastically if employees understand that successful JIT purchasing will improve the organization's success and that each employee's personal future depends on the organization's success. [Ref. 3:p. 68]

4. Lack of Communication

Lack of communication during implementation is one barrier that is not easy to overcome. Effectively developing and implementing JIT purchasing requires cooperation and integration in a number of important areas, including: quality control, computer systems management and engineering. [Ref. 3:p. 71]

If implemented properly, JIT purchasing requires less effort from quality assurance on a continuing basis. The supplier certification program ensures quality matters are handled by the supplier so that inbound inspection is not routinely performed. The purchasing office must inform quality control personnel about what constitutes an effective JIT program.

With regard to the engineering effort, buyers should acquire commercial items whenever possible. This shifts some responsibility from the engineers who develop item descriptions or MILSPECs, to the buyers who purchase the commercial equivalent. The engineers are vital to insure the commercial item can perform as the MILSPEC item. The engineers must know that they remain an integral part of the purchase operation. Similarly, the computer systems experts help the start up of EDI transmissions. These

computer systems management personnel will be integral team members during implementation.

Resolving the lack of communication and coordination in a JIT environment requires the continuous communication between purchasing personnel and all other personnel. Also, JIT implementation requires that all relevant offices become more conscious of the overall JIT objective. [Ref. 3:p. 72] The best way to ensure that the myriad of relevant offices support JIT implementation is to ensure each office is represented on the implementation team. Meetings must be held so the information flow can occur unimpeded. The communication flow is a responsibility that purchasing management must assume; purchasing must call regularly on top management for leadership and support. [Ref. 3:p. 72]

5. Competitive Practices

In 1984, Congress passed the Competition in Contracting Act (CICA). The law requires that Government agencies use full and open competition to procure property and services unless exemption is granted under seven exceptions. [Ref. 13:p. 688] CICA requirements may limit the Government's ability to enter long-term relationships with specific suppliers. Without a long-term commitment, suppliers will be reluctant to implement JIT systems. [Ref. 10:p. 8-3]

Buying offices are slowly learning that CICA does not preclude building long-term relationships with suppliers. Quite the contrary. There is no existing law or regulation specifically prohibiting the Government from awarding multiple contracts to a

consistently reliable, high quality supplier. Using a best value evaluation process during solicitation allows the Government to stress quality and past performance in choosing between suppliers. Over the long run, if consistently applied, best value evaluations should award contracts to the same suppliers if they continue to produce high quality, competitively priced products. This will enable the Government to establish some form of long-term supplier relationships and to reap the associated benefits. [Ref. 10:p. 4-5]

A long-term contract also ensures a long-term relationship for up to five years, in most cases. Different long-term contracts will be explained in more detail later in this chapter.

6. Formality of the Government Acquisition Process

The Government relies almost exclusively on formal contracting structures, using objective decision criteria for quality, testing, and acceptance standards and taking a relatively severe attitude towards enforcement. This tends to promote an adversarial relationship between the Government and contractor, based on literal Government contract enforcement and a "work to the rule" supplier. This is contrary to a relationship based on cooperation and teamwork; essential ingredients to building and maintaining good, long-term supplier relationships. [Ref. 10: p. 4-3]

The Federal Acquisition Streamlining Act of 1994 (FASA) reduces the structure required in acquisitions below \$100,000. This new threshold (\$50,000 if the Government entity does not have FACNET capability) will greatly increase productivity and decrease paperwork for the contractor and the Government. Section 4102 of the Act

also exempts simplified acquisitions from 13 laws which have burdened contractors in the acquisition process. [Ref. 29:pp. 64-69]

The lower quantities under JIT, coupled with more frequent deliveries, ensure many of the contractor orders will fall within the thresholds for simplified procedures. This shift should help establish closer ties and better buyer-seller partnerships. In addition, the pending H. R. 1670, if passed, will provide additional administrative relief for Title II-Commercial Items. [Ref. 26] Based on FASA of 1994 and potentially on H. R. 1670, the Government is providing a more level, commercial-type playing field for its suppliers.

7. Favored Customer Status

The Government expects to be treated as a most favored customer without recognizing that these relationships are partnerships. The most favored status must come in exchange for some benefit or consideration. Unfortunately, the Government, unlike commercial firms, cannot make the commitments necessary to establish and maintain long-term buyer-supplier relationships. This keeps qualified suppliers from conducting business with the Government. [Ref. 10:p. 4-4]

As purchasing offices move toward more long-term contracting, this particular barrier should be corrected. In marketing the JIT initiative, the buying organization should emphasize the Government's desire to encourage long-term relationships by

highlighting the long-term contract vehicles and statutory changes in FASA of 1994 and the impending legislation of H. R. 1670. These modifications enable the Government to earn their most favored customer status.

8. Protest System / Process

Protests in Government contract awards are so unpredictable and unmanageable that some vendors would rather forego Government business than suffer erratic oscillations in their business operations. The Government can avoid protests by spreading contracts around rather than staying with a quality vendor. [Ref. 10:p. 4-4]

This particular barrier has been addressed by the Clinger/Spence acquisition reform bill of 1995 (H.R. 1670). It specifies simplified procedures for disputes regarding contracts valued below \$20 million. It also dismisses frivolous protests brought in bad faith, and in specified circumstances, requires the protesting party to pay costs to the Government in defending the protest. [Ref. 26] With long-term contracting to cement the buyer-supplier relationship and additional incentives generated by the FASA of 1994 and H. R. 1670, contractors should be willing to forge long-term relationships with Government purchasing offices.

9. Delays in Prompt Payment

A customer who demands the best price and then fails to pay promptly, puts undue pressure on company profits. The Government has been viewed as a slow-payer. [Ref. 10:p. 4-4] The very selling point of JIT purchasing is decreasing paperwork and instantaneously transmitting payment through EDI. As mentioned in Chapter IV, EDI

and realigning the Defense Finance and Accounting Service (DFAS) should ensure payments are processed promptly. The JIT implementing office needs to minimize payment problems.

10. Quality Assurance, Quality Control, and Inspections

The Government's approach to quality may disrupt a supplier's production and distribution system, increasing costs and jeopardizing delivery requirements for both Government and commercial customers. [Ref. 10:p. 8-4] As discussed in Chapter III, once a supplier has satisfied the supplier certification program, the buying office relinquishes responsibility for supplier oversight. Quality assurance is the supplier's responsibility; the Government relies on commercial warranties, as described below.

11. Warranties

The Government protects its interests by requiring warranties on the products it buys. Many contractors feel that the warranties spelled-out in the Federal Acquisition Regulation (FAR) are excessive and require contractors to offer a Government warranty that exceeds the commercial warranty for the same product. This can be cost prohibitive for the contractor. [Ref. 10:p. A-12] The Government, in shifting to commercial initiatives, should abide by commercial warranties as written. The contractor's savings may result in lower Government costs overall.

12. Lack of Funding

Any program implementation requires appropriate funding levels. Depending on the changes required to implement JIT purchasing, organizations must purchase computer hardware and software, provide training, market the program to potential suppliers and hire the necessary personnel. Adequate funding will help ensure a successful implementation.

13. Lack of Personnel

Implementing a JIT purchasing operation requires dedicated personnel. Unfortunately, the organization's current personnel are tasked with performing existing work on a daily basis. Adding the requirement to implement a JIT initiative strains personnel resources. [Ref. 25]

To ensure a smooth implementation, a dedicated group is required to oversee the process. They should follow a schedule for implementation. Finding the personnel and funding to implement a JIT initiative may be the hardest aspect to overcome.

D. IMPLEMENTING ELEMENTS

The following section discusses the three main elements of the Buy Response Vice Inventories (BRVI) program, the Government's commercial JIT purchasing initiative. These include Direct Vendor Delivery (DVD), Long-term Contracting (LTC) and Electronic Commerce / Electronic Data Interchange (EC/EDI). This section also describes Prime Vendor and Corporate Contracting and other issues to consider when implementing JIT purchasing.

1. Direct Vendor Deliveries (DVD)

Direct Vendor Delivery (DVD) is the cornerstone of a successful JIT purchasing initiative. DVD ensures items are shipped directly from the manufacturer or dealer to the end user bypassing the warehouse. [Ref. 6:p. III-A-4] This forgoes the costs of receiving, inspection, remarking and outgoing freight.

Although DVD can provide benefits, there may be situations where depot stockage may be more cost effective. A variety of cost comparisons need to be made. Solicitations considering DVD should be structured to identify contractor cost data relative to distribution costs. [Ref. 6:p. III-A-5] To compare DVD and depot stockage costs, contract data should break out the contractor's costs to store, issue, package, handle and transport the item ordered. In determining whether an item can be direct delivered economically, the following factors should be considered: what minimum dollar value and order quantity will the contractor accept, what is the contractor's commercial pack, are items inspected at origin or destination, and what are the delivery time frames for high priority vs routine delivery requirements? [Ref. 6:p. III-A-5] There may be situations where DVD reduces costs. At other times depot stockage may be more cost effective.

The contract vehicle for DVD is an indefinite-delivery contract. Clauses and contractor supplied data are listed in the solicitation on a continuation sheet, standard form 36 after the contract line item numbers (CLIN) are listed. The Defense General Supply Center (DGSC) includes a section that requires all deliveries to be in the

continental United States. This is necessary because the buying activity does not know where delivery is to be made until an order is placed. Similarly, companies that bid must realize that the quoted price includes delivery in the continental United States. Items are usually inspected and accepted at destination. This requires the contractor to pay for shipping costs to the customer. Large suppliers with geographically dispersed distribution points may find a continental U.S. delivery of little concern. Transportation costs may increase for companies that have a single distribution point. These factors should be considered when putting together a JIT purchasing solicitation. Delivery times for urgent and routine requirements can be spelled out in the solicitation as the buying activity requires.

There are other considerations that must be pondered in DVD. Purchasing offices should realize that preservation, packaging, packing and marking (PPPM) requirements may be different for DVD items vice items delivered for depot stock. DVD items are generally consumed by the using activity shortly after delivery. Items in depot storage may be held for an indefinite period. These items require more preservation and more detailed marking. DGSC requires different marking instructions depending on the delivery location. [Ref. 36]

2. Long-Term Contracting

Long-term contracting (LTC) is designed to improve customer support, develop long-term arrangements with industry and reduce depot stock. [Ref. 6:p. III-A-7] LTCs allows the organization to process repeated requirements for the same items over a

specified period of time (not to exceed five years). [Ref. 24:p. i] The different long-term contract types are explained below:

a. *Indefinite Delivery Contracts (IDC)*

Indefinite delivery contracts are used when the requirement is known, but not the specific delivery times. There are three types of IDCs: Definite Quantity Contracts (DQC), Requirements Type Contracts (RTC) and Indefinite Quantity Contracts (IQC). [Ref. 24]

b. *Definite Quantity Contracts*

A DQC is used when precise requirements are known, but not delivery dates. Funds are obligated for the total requirement upon executing the contract. [Ref. 24]

c. *Requirements Type Contracts*

An RTC is used when specific requirements are not known. Funds are obligated upon executing each delivery order. The quantities of supplies or services specified in the schedule are estimates, they are not purchased by the contract. Unless specified elsewhere in the contract, if the Government's requirement changes from the estimated schedule, the contractor does not have a basis for an equitable price adjustment. [Ref. 36]

d. *Indefinite Quantity Contracts*

An IQC is used when you must estimate requirements with a minimum guaranteed quantity. Funds are obligated for the minimum quantity when the contract is

executed. [Ref. 24] The Government is required to order the minimum guaranteed quantities or supplies on services designated in the contract. [Ref. 15]

e. Additional Purchasing Vehicles

Four additional vehicles for ordering supplies or services are the Blanket Purchase Agreement (BPA), General Services Administration Schedule (GSA), Definite Delivery Contract with Quantity Option and the Indefinite Delivery Purchase Orders (IDPO). These will be described briefly but are not routinely used in a Government JIT purchasing environment.

- A BPA is an agreement, not a contract, which supports multiple individual purchases from the same firm. Exact items, quantities and delivery requirements are not known in advance and may vary considerably.
- The GSA schedule is a GSA managed IDC for supplies at stated prices for a given period of time. Purchasing offices use the GSA schedule to order directly from scheduled contractors when price/delivery schedule permits.
- A Definite Delivery Contract with Quantity Option is used to replenish inventories when the contractor refuses an IDC.
- An IDPO is used for repetitive, low dollar value items. The aggregate dollar value of all orders cannot exceed the small purchase threshold.

With the myriad of contract vehicles at the purchasing office's disposal, matching one to each buying requirement should become routine.

f. Additional Contracting Initiatives

Two areas closely related to long-term contracting are Corporate Contracting and Prime Vendor Contracting.

Corporate Contracting is designed to reduce lead times and increase product availability when a contractor is doing business with multiple offices in the purchasing organization. [Ref. 6:p. III-A-6] Corporate Contracting consolidates the requirements from multiple offices into one contract. Corporate Contracting stresses long-term contracts, DVD, and EC/EDI. The intention is to contract for a vendor's entire catalog of applicable parts and use their commercial distribution system or network to directly support the customers. [Ref. 6:p. III-A-6]

Prime Vendor Contracting combines IDTCs and advance pricing agreements. It provides JIT delivery to the customer. Under this program, commercial warehouses and distributors (called prime vendors) provide brand name products to customers. Prime vendors can provide any item they currently carry in their warehouse. This program has been a unqualified success for medical products in the Washington, D.C. area. [Ref. 17:p. 24]

g. Contractor Concerns

The contractors interviewed, as summarized in Chapter IV, had only one comment concerning long-term contracting. Due to the period covered by a long-term contract (not to exceed five years) the prices may become outdated and the profit margins shrink. Prices can be adjusted using an Economic Price Adjustment (EPA) clause. However, most EPA clauses cap price increases, prices can't exceed the cap. In the commercial sector, a cap does not exist. Contractors price their items based on

competitive, business and marketing strategies. It is sometimes necessary for contractors to price items the EPA caps.

Purchasing offices should allow contractors to reprice items above the established EPA cap in those rare instance when the pricing is dictated by competitive or economic forces. This would require the contractor to justify why the EPA cap should be breached. It would also require purchasing offices to incorporate an EPA reopener clause for the circumstance listed above.

3. EC / EDI

One of the most productive elements within the JIT purchasing arena is EC/EDI. As mentioned before, EDI is the computer-to-computer or application-to-application exchange of business documents using a standard electronic format. [Ref. 4:p. 4]

To ensure all Government and commercial purchasing offices can talk to each other in an EDI environment, standards were developed. Standard transaction formats in the United States were developed by the American National Standards Institute's (ANSI) Accredited Standards Committee X12 (ASC X12). ASC X12 constructed standards so that computer programs can translate data to/from internal formats without extensive reprogramming. Using internally developed or commercially available software and private or public-access communications networks, ASC X12 ensures that all sizes of firms and institutions can easily use intelligent computational devices to communicate with Government purchasing offices. Standard interchange formats can greatly increase efficiency compared to an environment where each institution imposes its own format

on every other institution with which it does business. [Ref. 4:p. 4] Standard transaction formats allow business and Government computers to exchange administrative data while freeing the acquisition professionals to perform procurement functions.

The Federal Acquisition Streamlining Act of 1994 (FASA) requires the Federal Government to implement the Federal Acquisition Computer Network (FACNET) no later than 1 January 2000. Title IX, Section 9001-9004 of FASA sets requirements for implementing FACNET and should be followed to determine requirements. This section of FASA does not dictate the best way to tie computer systems together, but indicates how implementation can be affected.

Because of the numerous EC/EDI initiatives currently used within the DOD, it would be impossible to come up with a universal EC/EDI implementing guide to cover all the current systems. Some of the systems include, the Navy's Automation of Procurement and Accounting Data Entry (APADE) system, the Air Force's Government Acquisition Through Electronic Commerce (GATEC) system, and the Integrative Technical Item Management and Procurement (ITIMP) system. Because Government contracting offices are required to fall under FACNET by 1 January 2000, many systems currently in use will be changed to some universally accepted system. DGSC currently uses POPS, which primarily allows for placing orders against long-term contracts for commercial type items.

DGSC publishes the communication configurations in their solicitations so the contractor can match their system to DGSC. In the solicitation, DGSC lists their

mainframe specification and the system recommended for the contractor to successfully exchange information. In section C of the solicitation, DGSC also publishes the transaction sets necessary to successfully process information. A transaction set is typically consisting of a group of data segments forming a complete EDI document such, as an invoice. DGSC also publishes a point of contact for EDI transmissions so any problem can be corrected.

EC/EDI is a complex area. It requires the correct personnel resources to administer it effectively. Successful data transmission is the objective of a properly functioning EC/EDI operation. To do this accurately and implement it correctly, purchasing office computer systems experts need to be involved in the earliest stages of any JIT initiative. Contractors also need to be involved so they are not caught off-guard when implementation begins. Some contractors have been involved in EC/EDI far longer than the Government and can give credible input during implementation.

The Government purchasing office should use the latest EC/EDI technology when implementing JIT. In the questionnaire answers in Chapter IV, some contractors mentioned that the Government is using antiquated equipment to transmit or receive data.

Prior to approving the EC/EDI element, practice transaction sets need to be sent to all contractor subscribers so they may eliminate problems before sending actual ordering data.

One of the most important aspects in implementing this element is communication. Communication throughout the entire process is crucial. Information sharing is required outside the organization, and just as importantly, inside the organization.

E. SUMMARY

This chapter provided a list of considerations that should be examined before a purchasing office implements JIT purchasing. A list of implementation barriers were discussed so the purchasing office can anticipate pitfalls that hinder JIT implementation. The major implementing elements were discussed to highlight how they are addressed in solicitations; brief recommendations were made for averting problems during implementation. Chapter VI provides conclusions and recommendations.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

Implementing Just-In-Time purchasing in the Department of Defense requires a concerted effort by DOD leadership to expand and perfect its use. The commercial sector has embraced the initiative and enjoyed its results. Implementation within the Department of Defense has been sporadic, but those organizations that have adopted JIT have received numerous benefits. The Department of Defense, with ever declining budgets and strains on other resources, must embrace the initiatives that make commercial companies more competitive. The implementation process at additional activities will be contingent upon having both resources available to carry-out implementation and the personnel required to conduct day to day work during implementation. With top-level DOD commitment and adequate resources, the cost savings and improved efficiency will prove to be well worth the investment.

Any purchasing office that has computer capabilities and processes repeated buys can benefit from JIT purchasing. As the JIT purchasing initiative spreads from purchasing office to purchasing office, resources can be used in a more effective manner, such as increased operating tempo and additional training.

B. CONCLUSIONS

1. Just-In-Time purchasing is a more efficient way to procure supply items and can be implemented throughout DOD.

JIT purchasing has proven to be an efficient way to procure items, as evidenced by years of practice in many commercial entities. DOD has registered successes through DLA's Buy Response Vice Inventory Program, a Government adapted commercial approach to purchasing.

The General Accounting office (GAO) has recognized BRVI's success and has called for commercial purchasing initiatives to be used throughout DOD.

2. The purchasing system DOD has used in the past is inefficient and leads to excessive inventories which the Government can no longer afford to carry.

Under previous purchasing practices, inventories were carried so that the logistics system could respond in a timely manner by drawing down inventories. These inventories represent billions of dollars of precious resources that now must be used for other important areas, such as operations.

3. DOD currently has the expertise to initiate JIT purchasing throughout its purchasing offices.

Personnel from DLA have experience implementing JIT purchasing on a large scale. Although much needs to be done even in DLA, DOD has proven it can incorporate JIT on a large scale, as evidenced by the success of DLA's BRVI program.

4. Only a limited number of purchasing organizations are currently using JIT purchasing to procure their supplies.

Much of the research indicates that JIT purchasing is being used on a limited basis throughout DOD. With the successes experienced within DLA, purchasing offices not currently involved in JIT purchasing should follow DLA's lead and implement JIT immediately. The Secretary of Defense has tasked defense organizations to use commercial initiatives at all DOD activities.

C. RECOMMENDATIONS

1. Implement JIT purchasing practices in all DOD purchasing offices.

The Just-In-Time purchasing process will improve efficiency at all purchasing offices and make better use of scarce resources. By implementing JIT purchasing, buying offices will align their operations to commercial practices. This directly supports the Secretary of Defense's commercial initiatives directive.

2. Implement a Bi-Annual Symposium to exchange ideas and share experiences in the commercial initiatives program.

Just-In-Time purchasing has greatly benefited several purchasing organizations, especially with those in DLA. As these successes are presented to other DOD organizations, they will be less inclined to conduct business as usual.

3. Develop a JIT purchasing "Home Page" on the World-Wide Web so JIT technology and experiences can be shared with interested parties.

One of the drawbacks to the present JIT initiative in the Department of Defense is that implementation is sporadic at best. By encouraging the free flow of information,

purchasing offices can ask and receive advice from a "Home-page" site to work out any problems. The site can be administered by an office that has been successful in JIT purchasing so that the information is pertinent and timely.

4. Utilize commercial products whenever practical to support JIT purchasing and the commercial supplier base.

Commercial products lend themselves to JIT purchasing concepts and directly support commercial contractors. With the tremendous reductions in the Defense budgets, DOD no longer has the resources to support all present suppliers. By emphasizing commercial products, contractors can mitigate the decrease in defense orders by expanding commercial opportunities. This will allow more suppliers to continue long-term operations.

5. Incorporate commercial initiative training at all DOD purchasing activities.

JIT training at all Government purchasing offices may spark ideas to reform the JIT implementation process. It may also encourage offices that currently do not use JIT purchasing to investigate the possibilities of implementation at their office.

D. THE RESEARCH QUESTION

The conclusions and recommendation listed above address the questions presented in Chapter I. A further summation follows.

1. How can DOD organizations implement Just-In-Time Purchasing thereby reducing inventories of on -hand stock?

DOD organizations can implement Just-In-Time purchasing by following a systematic process. The process should highlight the actions necessary to embrace implementation. This includes making sure certain conditions are met prior to implementation. These conditions include characterizing the products or services being procured, whether to centralize or decentralize the implementing and controlling office, having commitment from top level executives and retaining well prepared, committed employees.

The implementation process includes an in-depth knowledge of the barriers to establishing Just-In-Time purchasing. Some of the barriers include lack of top management support, lack of employee readiness, lack of communication between implementing elements and various barriers inherent in the Government purchasing environment.

Finally, the Government purchasing office can implement Just-In-Time purchasing by understanding the primary elements that allow inventory reductions. These elements include long-term contracting, direct vendor delivery and electronic commerce/electronic data interchange.

2. What is JIT Purchasing?

JIT purchasing ensures uninterrupted flow of 100 % acceptable materials delivered on due dates, at optimal cost, 100 % of the time. It develops the buyer-

supplier relationship through long-term contracts, direct vendor delivery and electronic commerce/electronic data interchange. In effect, it substitutes buyer-supplier logistics coordination for the buyer's requirement to maintain large inventories.

3. What Benefits are Derived From Implementing JIT Purchasing?

Just-In-Time purchasing reduces costs, increases product quality, facilitates response to design innovativeness, increases administrative efficiency by reducing the number of suppliers and contracts and reduces requirements to expedite deliveries. It also increases productivity by reducing paperwork and inspections.

4. What is the Magnitude of Inventory Problems Within DOD?

As of fiscal year 1995, DOD carried approximately \$36 billion in excess inventory. This includes aircraft components and parts; missile parts; weapon parts; tank and vehicle parts; ship and submarine parts; electronics, communications, control and information systems, and related parts; construction, industrial and general supplies; petroleum; clothing and textiles; subsistence; medical and dental material; and uncategorized minor equipment.

5. What are the Key Elements That Constitute a Successful JIT Purchasing Operation?

The primary elements include: direct vendor delivery, which bypass depot storage and delivers the item directly to the user; long-term contracting, which establishes a long-term relationship where repeated product buys are procured from the

same contractor over a period not to exceed five years; and electronic commerce/electronic data interchange, where solicitations, proposals, contract formation and ordering data are transmitted via computer-to-computer link.

Additional secondary elements include: Corporate Contracting, which groups common items from various purchasing offices in one contract; and prime vendor contracting, which uses commercial warehouses and distributors to provide brand name products via Indefinite Delivery Contracts (IDC) and advance pricing agreements to various customers of the purchasing office.

E. AREAS FOR FURTHER RESEARCH

The area that can most use the Just-In-Time purchasing application is Hazardous Materials. The focus on environmental issues has made the Just-In-Time deliveries of hazardous materials a necessity in today's environmentally friendly world. Hazardous materials usually involve dated shelf life items that become a burden to dispose of properly. Many depots have built warehouses just for storing hazardous materials. With just-in-time deliveries, hazardous products can be delivered in fresher condition, without special facilities for handling and storage.

Another area for further research would be Just-In-Time deliveries of petroleum products. Currently, DOD maintains a vast infrastructure to receive, store, transport and deliver petroleum products world-wide. With Just-In-Time deliveries, the infrastructure could be vastly reduced. This would reduce handling costs necessary to support petroleum products.

Another area for Just-In-Time purchasing is the delivery of any dated shelf life item. By directly delivering these items, products are fresher and fewer overage items need to be deleted.

Studying the feasibility of implementing JIT purchasing for any of the above areas would help solve numerous problems now encountered in the Department of Defense.

APPENDIX

ACRONYMS

1. **ANSI - American National Standards Institute**
2. **APADE - Automation of Procurement and Accounting Data Entry**
3. **ASC - Accredited Standards Committee**
4. **BPA - Blanket Purchase Agreement**
5. **BRAC - Base Realignment and Closure Commission**
6. **BRVI - Buy Response Vice Inventory**
7. **BUR - Bottom-Up Review**
8. **C/SCSC - Cost Schedule Control System Criteria**
9. **CICA - Competition in Contracting Act**
10. **CIM - Corporate Inventory Management**
11. **CLIN - Contract Line Item Number**
12. **COTS - Commercial off the Shelf**
13. **DGSC - Defense General Supply Center, Richmond, VA.**
14. **DLA - Defense Logistics Agency**
15. **DOD - Department of Defense**
16. **DODAAC - Department of Defense Automated Addressing Code**
17. **DOS - Disk Operating System**
18. **DQC - Definite Quantity Contract**
19. **DVD - Direct Vendor Delivery**
20. **EC/EDI - Electronic Commerce/Electronic Data Interchange**

21. **EPA - Economic Price Adjustment**
22. **FACNET - Federal Acquisition Network**
23. **FAR - Federal Acquisition Regulation**
24. **FASA - Federal Acquisition Streamlining Act**
25. **FISC - Fleet and Industrial Supply Center**
26. **GAO - General Accounting Office**
27. **GATEC - Government Acquisition Through Electronic Commerce**
28. **GSA - General Services Administration**
29. **IDC - Indefinite Delivery Contract**
30. **IDPO - Indefinite Delivery Purchase Order**
31. **IQC - Indefinite Quantity Contract**
32. **IQC - Indefinite Quantity Contract**
33. **IRP - Inventory Reduction Program**
34. **ITIMP - Integrated Technical Item Management and Procurement**
35. **JIT - Just-In-Time**
36. **LTC - Long-Term Contract/Contracting**
37. **NCMA - National Contract Management Association**
38. **NSN - National Stock Number**
39. **OSD - Office of the Secretary of Defense**
40. **POPS - Paperless Order Placement System**
41. **PPPM - Preservation, Packaging, Packing and Marking**
42. **RTC - Requirements Type Contract**

- 43. **RTC - Requirements Type Contract**
- 44. **SR - Supplier Relationship**
- 45. **UCC - Uniform Commercial Code**
- 46. **VAN - Value Added Network**

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